Commercial Department War Time Measures—
Performance of Electric Furnaces in Non-Ferrous Metallurgical Processes

Electrical World

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Action Is Needed

THE central station industry is beginning to feel the bite of the war. There is no serious trouble yet, but many a manager is worrying about the continuance of his coal supply, and many another knows only too well that the fuel costs in the coming season may be somewhat disastrous. Now, the maintenance of public power and light service is a matter of vital importance. We cannot go back to gas and oil, and reversion to steam means tremendous waste of fuel. Meanwhile coal strikes are on, railway strikes are threatened, and freight service is getting further and further behind the game. Somehow or other, in order to meet the growing requirements of industry, public service corporations must obtain an opportunity to run if the country is to prosper and show increased rather than decreased output. Some of the efforts to help the fuel outlook have been as destructive as constructive. Much well-intentioned advice has been given, as, for instance, the recent request that tradesmen should cease using electric signs so as to save the coal that is not being mined because the labor situation is not controlled with a firm hand. The water powers on the public domain are still locked up tightly, so that no relief is coming at present from that all-important source. Only the other day Director Garfield found large stores of coal carefully hoarded by industries not in the line of war needs, the owners of which were still calling for added supplies.

If we throw off the brakes that are being put on by timidity, conservatism and rapacity on the part of various members of the community and drive ahead to organize the country's industries with close reference to present needs, the fuel outlook will be less perilous. There is ample power at hand and sound public opinion will support whatever radical action is necessary. Observation and report in the great cities of the country do not indicate, in spite of the declared shortage of labor, any considerable decrease in the number of loafers. Why not try the Maryland plan on a large scale? If government control of the coal mines is necessary to keep up the output let the government, in spite of hidebound traditions, go to it promptly. The public utilities of the country must run, and however they may try to economize fuel, a certain minimum must be furnished them at all hazards lest our civilization be put out of joint and the industries vital to the war and to the provision of real necessities for the population be crippled.

If the electric roads cannot run to their fullest capacity, a very important means of transportation for men and material will be seriously damaged. The electric roads of this country can be of immense service in the handling of local freight, thereby relieving the main lines of transportation. If they have not freight franchises and means of connecting trackage with the lines whose burdens they are to relieve, it is up to the authorities to loosen requirements made for peace times and to see to it that every wheel useful to the country's work is kept turning. Above all, cut loose the petty tangle of objections that block the development of water powers, and let the country get at the earliest possible moment energy for running mills and factories and railroads without calling on an already short fuel supply. As it now is, big enterprises meaning vast gain to the country's resources are stopped by snarls of red tape or petty objections raised in behalf of half a dozen flat-boats a month. We should let go the brakes on the industrial machinery and see to it that things are done irrespective of the timid conservatism which shrinks from going ahead in time of need.

Regarding Underground Distribution

A BRIEF paper in this issue by M. Labov shows a very practical method of keeping track of the underground distribution of a company using both the overhead and underground systems and subject to the ordinary conditions of shifting distribution and disused services. The starting point is a standard distribution map showing the location of manholes, length and number of ducts, location of services and so forth. These maps are kept on file in a loose-leaf binder, and when a new service is necessary the full data are at hand for the layout of the service and the connections to the various lines. Then, monthly, all the underground properties are summed up and subdivided according as they belong to the main or the secondary distribution systems, classified according to the paving involved, and added to a regular inventory showing the ensemble of the details. This gives a general conspective view of the underground layout. In connection with it is a neatly tabulated form, shown in the paper, which summarizes the house services, curb services and risers, whether used or unused. This covers the secondary distribution system. The rapid changes in such items make it difficult to keep them in the inventory form, but the tables give the facts in the case, from which the conditions in any emergency that arises can be promptly ascertained. In a growing system of distribution such details are notoriously hard to keep track of, and the forms worked out in this instance should be of very material assistance to many an electric company.

The Electric Furnace in Metallurgy

WE PUBLISH this week an abstract of an important paper by Dwight D. Miller regarding the use of the electric furnace in fields outside of the iron and steel industry. It is only recently that serious efforts have been made to utilize electric heat on a large scale for other metallurgical work, in spite of the fact that its advantages are very conspicuous. It is a well-known fact that alloys have to be handled somewhat tenderly. Some of them are very seriously subject to oxidation, others tend to separate if incautiously overheated, and still others have a very narrow range of working temperature within which they can be successfully cast. Some, indeed, are difficult to cast at all under ordinary conditions; for example, magnalium, which of late years has been finding many uses. For these critical cases of metallurgy the electric furnace has very much to recommend it. It is efficient; the heat can be accurately concentrated; the temperature can be brought with precision to any desired point and can be utilized in any kind of an atmosphere or even in vacuo; it produces quick and clean heat and avoids a great deal of the labor and space required with furnaces of the ordinary type. All these things result in less waste and better working conditions, tending to higher efficiency in the labor employed. Again, the power can be measured with precision and kept down to a minimum for the work required, and there is besides a large saving in fuel, now a matter of serious consequence.

A number of types of furnaces for the metallurgy of brass and other alloys have recently been put into at least experimental use, and the results are altogether promising. They are in general of two classes, the arc and the resistance types, although the two methods are in at least one instance combined. All are designed for alternating current, since the power supply in this country is generally either three-phase or single-phase. Much of the work will naturally be done on brass and similar alloys, and experiments show that the energy consumption is moderate, and that the brass produced, from the absence of oxides and impurities, is of improved quality in tensile strength. In one instance it was found that the energy required for remelting red brass for castings was at the rate of only about 250-kw.-hr. per ton and the efficiency of the furnace somewhere around 75 per cent. The power required seems not to be materially different for the arc and resistance types, and in both, too, the power factor is very high, from 96 per cent up. The load is therefore a desirable one from the standpoint of the distributer of electricity. Besides the use of furnaces in brass working, they are also in service for silver, copper and various bearing metals, alloys of accurately determined character.

The net result of the experiments seems to show that the losses of metal are small, a matter particularly important in working silver; that the quality of the product is remarkably well maintained, and that the casting is good. As to costs, the results are on the whole economically sound, especially when the handling of fuel and ash is considered as well as the direct saving of labor. The furnaces already employed run in capacity from 30 lb. or so (about 14 kg.) in the silver industry up to a ton in some of the alloy working, so that the experience covers a wide range of capacity as well as material. Experiments are now under way for still further saving of labor by the electric furnace through making castings directly from the furnace itself. This can be accomplished either by picking up the furnaces, if of small size, and bringing them to the pouring floor, or in larger works by carrying the molds to the furnaces on conveyors. All this shows an extremely promising beginning of what is likely to be a very important application of electric power. It is one that may prove to be of no little importance as an advantageous load for central stations and as reducing very materially the net cost of manufacture with an additional chance of material improvement in the quality of the product.

Education for Industrial Research

THREE papers were read at the recent Philadelphia convention of the American Institute of Electrical Engineers on different aspects of industrial research. As reported in the ELECTRICAL WORLD for Oct. 13, the subject evoked much discussion from a large assemblage. One remarkable feature of the papers was that all three were in close mutual agreement on various points, so much so in fact as to elicit from one of the authors an amusing virtual apology for the apparent unanimity and an assurance that the papers had been written independently and without consultation.

The trend of the discussion showed that the last ten years have brought about a considerable change in industrial demand with relation to research. Formerly it was expected that the technical colleges should prepare their graduates in the fundamentals of engineering, with a view to entering manufacturing salesmanship, only a limited number of graduates being needed in manufacture. More recently it has been recognized in this country that all of the executive officers engaged in technical manufacture, besides the designers, engineers and salesmen, have to be well grounded in applied science. Now there is a specific demand for technically trained graduates who are competent to take junior positions in industrial research work.

It was pointed out by more than one speaker that since it took a regular four years' course at a technical college to produce, on the average, an engineering graduate of the minimum standard attainments, it was necessary, under ordinary conditions, for the students possessing research ability to take a fifth or extra graduate year of special research college grade, in order to prepare themselves for posts in industrial-research laboratories. This being a generally accepted proposition, it was very desirable that the industries which had already experienced benefits from the policy of maintaining their own industrial research laboratories should foster the development of researchers by founding research fellowships or scholarships in the universities or technical colleges. An industry might very properly and profitably establish one or more unrestricted research fellowships in an engineering col-

lege without thereby creating any commercial jealousies. Without the aid of such fellowships technical students almost always seek to enter business life immediately after graduation, whether they have research ability or not; whereas, under the stimulus of such fellowships, those who had already manifested an inclination for research would be enabled to develop themselves by an extra year of laboratory work into properly qualified researchers. Such specially gifted and selected men might be depended upon to advance the industry in which they subsequently enlisted.

It has to be remembered that industrial research, although it has paid splendidly in many cases and is likely to do so again in many more, is likely to pay only when the men employed in research have special gifts or abilities in that direction. There can be, and there should only be, a relatively small number of technically trained young men graduating from the colleges of the country to take up industrial research work effectively. The majority are likely to have gifts and aspirations for other posts, such as designers, managers, constructors or salesmen, all of which are in demand. Industrial research will have a magnificent future if properly selected men go into it, and if men who are not gifted that way are induced to keep out of it.

Fundamental Data of Photometry

A VERY important research paper by Coblentz and Emerson has just been published as No. 303 of the scientific papers of the Bureau of Standards. We commend it to the special attention of all who are interested in photometry, and particularly in the heterochromatic photometry which of late has been assuming so much importance. It is a thorough study of the average eye in relation to its sensibility to light of various colors. The particular importance of the work may be appreciated from the fact that the authors have plotted in one composite mass of visibility curves the carefully measured results obtained from 125 observers. No work with which we are acquainted gives data anything like so complete. To the student of physiological optics the results are particularly striking as showing what of course has been long understood, but never so fully and completely proved, that what one may call "normal" color vision is only an average of variables. A few of the observers studied had what would ordinarily be called partial color blindness—that is, variation from average color vision considerable enough to respond to somewhat rough tests, and particularly to cause material confusion in colors. But the curves from these cases pass by imperceptible gradations through average values to values in the opposite direction.

A glance at the composite curves shows with the utmost distinctness that the variations between eye and eye present gradations so gradual that the most which can be said is that there is an approximate average curve from which variations of small degrees are the rule and not the exception. The ensemble curves also show very beautifully the fact familiar to the physiologist that variations in color sensibility affect the red more commonly than the green or blue, the green probably being subject to the least variations. It is particularly striking to note the number of cases in which red perception took the plus instead of the minus sign, twenty-six of the subjects showing in greater or less degree this peculiarity, first noted by Lord Rayleigh and subsequently confirmed by others. On general principles plus color variations should be as common as minus variations, and they probably are so in fact, although not often detected by the rather crude tests of the early ophthalmologists.

From a purely practical standpoint the work of Coblentz and Emerson has a very important bearing on heterochromatic photometry. It shows the frequency and amount of probable errors in measuring lights of various colors and incidentally serves to emphasize the greater regularity and probably greater precision of measurements obtained on lights of different colors by the flicker method. The data obtained are sufficiently extensive to permit an average by which the visual sensation of light can be correlated to radiant energy, affording therefore a sounder basis for physical photometry than has hitherto been available. We cannot here do more than touch on the valuable data presented by this paper, and we commend it to critical reading by those interested in the subject.

The Coming Issues

BEGINNING with the first issue of November, the ELECTRICAL WORLD will publish a series of articles on the application of electric motors and control apparatus to various industries. The series will comprise approximately sixteen articles, the first eight of which are planned to contain a well-worked-out treatment of the fundamental aspects of the whole problem. The series will be prepared by Prof. C. E. Clewell of the University of Pennsylvania, which institution is now engaged in perfecting a course on the same subject. In addition, articles are expected from specialists on control and motor applications. These will appear from time to time during the same period and after the completion of the series mentioned. Among the subjects which will be treated are the following: Electric power for industrial operation; central station power for the industries; distribution of electric power in the factory; attitude of machine-tool builders to motor drive; a study of group and individual motor drives; speed, torque and power in machine-tool motor work; constant and adjustable speed motors for factory drives; fundamental features in the problem of industrial control; problems in motor drive for lathes; operation of motor-driven planers; motors and control for crane operation; operation and control of motor-driven fans and blowers; modern methods of electric drive in steel mills; motor applications in textile mills; the application of flywheels to motors; use of the graphic meter in motor application. Other articles next week will be one on the minimum-cost method of designing transformers and another on the steps taken by a Middle West company to standardize outdoor substations. Interesting subjects from the public policy viewpoint will also be discussed.

The Electric Furnace for Non-Ferrous Metallurgy

Advantages Derived from the Use of Electric Heat in This Industry, Types of Furnaces Under Experimentation or in Commercial Use, and Data on Performance Under Various Conditions

SOME of the many advantages to be gained by the use of electric furnaces in metallurgical processes involving non-ferrous metals were brought out by Dwight D. Miller of the engineering department of the Society for Electrical Development at the recent annual meeting at the American Institute of Metals in Boston. A brief review was given of the development in the use of electric furnaces in the steel industry of this country, together with an account of what has been and is being done to develop an efficient furnace for the non-ferrous industry, particularly in the manufacture of brass. Classifications of the various types* of electric furnaces are given in the original paper, together with a general description or outline of their construction, principles of operation and control, and advantages to be gained by their use. Finally results which have already been obtained in the commercial field were presented.

Although the electric furnace has been in use in this country in the steel industry for slightly over eleven years (about 471 furnaces of seventeen different makes being in use throughout the world), it is somewhat remarkable that only intermittent attempts have been made to develop a similar furnace for the commercial production of copper and its alloys, such as brass and bronze, until within the last three or four years, especially so since the many advantages to be gained by the use of the electric furnace have been fully demonstrated and recorded in its application to the steel industry.

Specifically, some of the many advantages to be gained from electric heat include:

1. Greater thermal efficiency, since electric energy is changed into heat without loss and utilized at many times the efficiency of combustion devices.
2. More positive and accurate control of both time and temperature.
3. It can be concentrated at any desired point and confined to a definite area.
4. It can be produced in the exact quantity and at the temperature desired, and these conditions can be duplicated at will.
5. It produces "clean heat" and allows of greater flexibility of operation.
6. It can be utilized in any atmosphere, oxidizing, neutral, reducing or even a vacuum.
7. By its use greater product for a given time is produced and its quality improved.
8. Saving in time, labor and space with the attendant saving in overhead, real estate and taxes.
9. Much improved working conditions, resulting in higher labor efficiencies.

There is a large saving in space and labor due to the fact that the storage of coal and ashes, together with the labor required for handling them, is done away with. Then, too, one electric furnace capable of handling a 1200-lb. (543-kg.) melt replaces six pit crucible furnaces handling 200 lb. (90.7 kg.) each, and yet occupies no more space than one of these furnaces when the space required for handling coal and ashes is taken into consideration. Again, it takes no longer to melt the 1200 lb. in an electric furnace than it does to melt the 200 lb. in the crucible. In almost all instances, in fact, the time is shorter. All of which means that there is a large saving, both in space required and in time, of pounds of metal melted per square foot of operating area, with the attendant saving in overhead, real estate, taxes and labor.

Since it is standard and practically universal practice to measure the electric power used by a furnace by means of at least a voltmeter and an ammeter mounted on the operating board, the total input can be seen at a glance and easily recorded. In case a graphic recording instrument is used, the record is made automatically for the entire day's run so that the amount of power used each minute or hour can be read from it. Thus a complete power record in this case is made without any effort of the operator.

In melting non-ferrous alloys a large part of the metal loss is occasioned through volatilization of the zinc content. This again is dependent upon both the temperature used and the rate of heating as well as upon protection against the oxidizing influence of air. Having found out by experimentation just what these factors should be for a given alloy, those exact conditions which produce the best results can be duplicated at will time and time again on account of the ease, flexibility and nicety of control possible with the use of electricity.

PRESENT PROGRESS AND DEVELOPMENT

The furnaces which have been designed and are now under experimentation include the Gillett furnace (indirect-arc type), patent assigned to the government, Department of the Interior, Bureau of Mines; the Conley furnace (molded-resistor type), controlled by Florance & Hampton, 1270 Broadway, New York; the Thomson-FitzGerald furnace (reverberatory resistance type), controlled by John Thomson, 253 Broadway, New York; the Northrup furnace (induction type without iron core), controlled by the Ajax Metal Company, Philadelphia, and the Hering "pinch-effect" furnace, controlled by Carl Hering, Philadelphia, although an option is held by the Ajax Metal Company for handling brass in the furnace. Other furnaces are under experimentation, but the companies interested in them are averse to giving any information thereon.

The Gillett furnace, invented by Dr. H. W. Gillett, is an indirect-arc furnace so designed as to bring about a violent agitation of the charge by a rocking motion. Some tests have been conducted during the past summer, but the results cannot be made public at this time.

The Conley furnace, invented by William H. Hamp-

*Some of the information contained in the author's papers was taken from two pamphlets, "Industrial Heating as a Central Station Load: Part I, Electric Furnaces; Part II, The Utilization of the Heat of Electric Energy," prepared by the writer and recently issued by the Society for Electrical Development.

ton, is a resistance furnace of the molded-resistor type, in that the charge is melted in an open graphite crucible which closes the secondary circuit. The voltage is applied directly to the sides of the crucible, the latter being inclosed in an iron-plate casing packed with Kieselguhr. Hand control is used for varying the voltage in the primary circuit and consequently in the

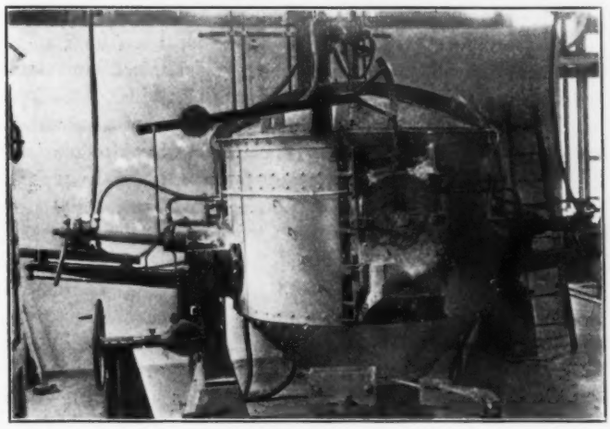


FIG. 1—INDIRECT-ARC-TYPE FURNACE FOR NON-FERROUS METALLURGY (RENNERFELT)

secondary circuit. The furnace is capable of melting 100 lb. (45.3 kg.) of copper with 12 kw.-hr. input. The power factor is practically unity—98 to 99 per cent.

The Thomson-FitzGerald furnace, invented jointly by John Thomson and Francis A. J. FitzGerald, is a resistance furnace of the reverberatory type, the heating effect being produced by radiation from especially formed resistors and reflection from the walls and roof of the furnace inclosure. The apparatus, which is designed for the purification of spelter containing metals, has been tested chiefly for the fuming of impure zinc. While the furnace has been successful in producing extremely pure zinc, no performance data are available for publication.

The Northrup furnace, invented by Prof. Edward F. Northrup, has been under experimentation for the last year, during which time some data have been obtained. The furnace is an absolutely new departure in furnace design and principle of operation. It employs oscillatory current at very high voltage, the oscillation being produced by discharges from a condenser and being conducted to a series of closed coils which are mounted concentrically on cylindrical crucibles and insulated from each other. A 20-kw. Northrup furnace will melt 45 lb. (20.4 kg.) of brass scrap in thirty-five minutes, starting from the cold. Temperatures as high as 1600 deg. C. are readily obtained. The furnace is admirably adapted to make melts in vacuum and is now being used by the author for melting both glass and electrically conducting materials.

"So far as the writer is aware," said Mr. Miller, "nothing is being done at present with the Hering 'pinch-effect' furnace, which has been fully described in the technical press."

COPPER-ZINC-ALLOY FURNACES

The furnaces that are in actual commercial practice for handling copper-zinc alloys include the Ajax Wyatt furnace, controlled by the Ajax Metal Company, Philadelphia; the Foley furnace, controlled by Charles B. Foley, Inc., 170 Broadway, New York; the Baily furnace (reverberatory resistance type), controlled by the Electric Furnace Company of America, Alliance, Ohio; the Rennerfelt furnace (indirect-arc type), represented by Hamilton & Hansel, 17 Battery Place, New York; the Snyder furnace (direct-arc type), controlled by the Industrial Electric Furnace Company, 53 West Jackson Boulevard, Chicago, and the Hoskins furnace (resistance type), controlled by the Hoskins Manufacturing Company, Detroit, Mich.

The William A. Rogers Company, Ltd., which uses Baily furnaces, states that virtually no metal losses are involved when handling silver using two crucibles holding approximately 500 oz. (14 kg.) each, that the metal appears more homogeneous, and that a better melt is obtained. The first heat takes about one hour and thirty minutes, while the others take approximately one hour, the average total time for charging, melting and pouring being approximately one hour and seven minutes. The company can get about eight heats (of two crucibles each) in a day of ten hours.

The pouring temperature is around 2200 deg. Fahr. (1209 deg. C.), although no pyrometer is used, the temperature being judged by the color. The furnaces operate with a constant input of 30 kw., which figures out 960 kw.-hr. per ton. The electrodes in the silver furnace are replaced once every three months, but as they use the butts left over from the annealing furnaces this renewal costs them practically nothing.

The Otis Elevator Company has two Baily annealing furnaces of 300 kw. and 150 kw. capacity for treating steel and brass castings. About the only trouble experienced has been an occasional cracking of the resistor troughs, thereby necessitating patching. These two furnaces are energized by one three-phase trans-

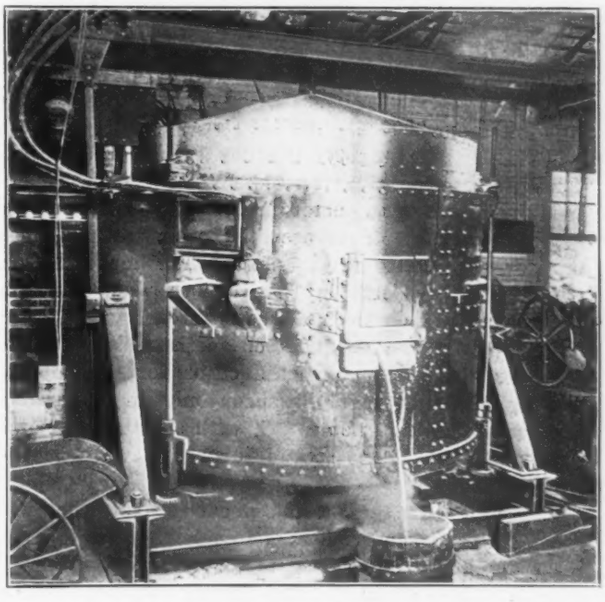


FIG. 2—RESISTANCE-TYPE REVERBERATORY FURNACE WITH HEATING ELEMENT IN ROOF (BAILY)

former, the large furnace operating two-phase and the smaller one single-phase. The troughs are in series, thus producing an even balanced load.

The castings treated vary from 3 lb. (1.4 kg.) up to 7000 lb. (3175 kg.) each. The larger furnace can handle a charge up to 12,000 lb. (5443 kg.) of metal,

while 7500 lb. (3402 kg.) can be charged in the small furnace. The metal is treated at a temperature ranging from 1500 deg. Fahr. to 1850 deg. Fahr. (815 deg. C. to 1026 deg. C.) and heated for from sixteen to twenty hours. Starting with a furnace temperature of approximately 750 deg. Fahr. (398 deg. C.) and running up to an annealing temperature of 1600 deg. Fahr. (871 deg. C.), at which time the current was shut off, the cost per ton was approximately $7, the total time the power was on being nineteen and three-quarters hours.

At the Lumen Bearing Company, Buffalo, copper, lumen metal, phosphor and manganese bronze are being handled in Baily furnaces. The charge is 600 lb. (272.2 kg.), consisting of scrap and ingots. Short test runs on both lumen metal and phosphor bronze under far from ideal conditions resulted in a consumption of 12 kw.-hr. for lumen and 22 kw.-hr. for phosphor bronze per 100 lb. (0.49 kw.-hr. per kg.). The company states, however, that as soon as it gets to running ten hours per day six days in the week it expects to reduce these figures to 10 kw.-hr. and 17.5 kw.-hr. respectively, basing this expectation on making the hardener used with lumen metal, and which forms 28 per cent of the melt, separately in a crucible.

The lumen metal is poured from 1250 to 1600 deg. Fahr. (754 to 871 deg. C.), the phosphor bronze at approximately 2200 deg. Fahr. (1209 deg. C.). The heats average about one hour so that eight or nine heats can be made in a ten-hour day according to conditions. The metal loss will vary from 2½ to 3½ per cent for the lumen metal, the test on the phosphor bronze showing 2 per cent.

With the idea of getting the hearth in good condition a melt of copper amounting to 1512 lb. (685 kg.) was run just previous to the test run on phosphor bronze. This was held for four hours and twenty minutes with a consumption of 24.8 kw.-hr. per 100 lb (5.5 kw.-hr. per kg.), starting with the furnace hot. The charging was done in nine separate lots extending over three hours while six pours were made, ranging from 2000 deg. to 2100 deg. Fahr. (1094 deg. to 1150 deg. C.) in forty minutes. Under these conditions the figures given should not be considered as a true indication of the performance of the furnace when handling copper. It is possible to charge manganese bronze immediately after a lumen heat since the zinc which might be left in the furnace would have no injurious effect on the manganese bronze.

Of the two furnaces installed one has been in operation for six months and the other for two months. During this time there has been only one renewal of the bottom, costing about $50, with some slight patching in addition. The second furnace, however, is not run every day.

Regarding savings the statement is made that with coke costing $4 and crucibles 4 cents there is a saving made by using electricity at 0.75 cent per kilowatt-hour, which is virtually what is paid. In addition, the labor of carrying the coke and ashes is eliminated together with the space for their storage.

The Hoskins Manufacturing Company gives the following information regarding the performance of several of its furnaces: "The smaller, holding one crucible, usually gives four to five heats of 23 lb. (10.4 kg.) each per day, but we have no power figures on it. It is lined with 4½ in. (11.4-cm.) magnesite back of the resistor and 4½-in. (11.4-cm.) firebrick back of this. This brick lining has to be rebuilt every six to eight weeks and is patched every Saturday. The larger furnace, taking two crucibles, is lined with 4½-in. (11.4-cm.) carborundum bricks just back of the resistor, with 3-in. (7.6-cm.) powdered silica back of this, and finally with 2½-in. (6.4-cm.) Kieselguhr brick back of this. This furnace has to be rebuilt every three to four months, and it is patched every Saturday. In it the current is turned on every morning at 4.30, increased at 7 a. m. to probably 40 kw., when charging begins, and later run at 50 kw. to 60 kw. Five heats of 23 lb. (10.4 kg.) each are usually turned out per day, the first at about 11 a. m. and the others every one and a third to one and a half hours, using for the day from 450 kw.-hr. to 525 kw.-hr. These alloys are poured at about 2900 deg. Fahr. (1589 deg. C.)."

RESULTS OF TESTS ON BRASS

The results of five tests on yellow brass (65 to 85) showed an average of 49 kw.-hr. per 100 lb. (1 kw.-hr. per kg.), pouring at 1950 deg. Fahr (1063 deg. C.). The melt was made in a 70-lb. (31.8-kg.) crucible in an

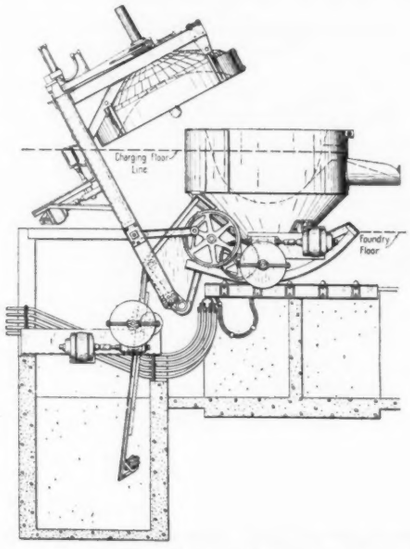


FIG. 3—DIRECT-ARC FURNACE WITH REMOVABLE ROOF TO PERMIT CHARGING THROUGH TOP

FC furnace. The total time per heat outside of the first, which took two and a half hours, was approximately one hour. Eight tests on red brass showed an average of 36.5 kw.-hr. per 100 lb. (8 kw.-hr. per kg.), pouring at about 2150 deg to 2175 deg. Fahr. (1170 deg. to 1190 deg. C.). The first and average heat took the same time as for yellow brass. No metal loss was given in either case.

"The only installation of Snyder furnaces handling non-ferrous metals of which I am aware," said Mr. Miller, "is that at the Chicago Bearing Metal Company. The power factor is in the neighborhood of 60 per cent." The furnaces have a capacity of about 2000 lb. (907 kg.) of metal per heat, and the average power consumption is not over 300 kw.-hr. per ton (333 kw.-hr. per t.). They operate twenty-four hours per day, Sundays excepted, and handle a heavily leaded bronze such as is used for railway car and locomotive bearings. The composition of the metal is approximately 75 per cent copper and the balance is lead, tin and miscellaneous

impurities in that order of importance, the lead running about 15 per cent. The metal is poured at approximately 2100 deg. Fahr. (1148 deg. C.), and while the metal loss is fairly high, mostly lead and some copper, about $12,000 net is saved per month by doing away with the crucibles, since these two furnaces replace forty to fifty coke and oil-fired furnaces. The high metal loss follows naturally from the use of a direct-arc furnace, since it is bound to produce a superheated top layer in the bath.

Rennerfelt furnaces of 1/3 ton (302 kg.) and 1200 lb. (544 kg.) capacity are in operation at the Gerline Brass Foundry Company's plant, Kalamazoo, Mich., and at the Philadelphia Mint respectively. At the mint some French and Italian coins composed of almost pure nickel have been handled, the lining standing up very well although the melt was at a high temperature. They use a ganister bottom with silica brick linings. This furnace should give a very good account of itself in handling alloys of this nature.

In the furnace at the Gerline brass foundry red brass, enamel tank (half red and half yellow brass with not over 22 per cent zinc content) and monel metal have been handled, but not much success was attained with yellow brass ingots. The furnaces could not handle yellow brass borings at all. This was only to be expected since neither the direct nor the indirect arc type of furnace is suited for handling alloys containing metals which volatilize at comparatively low temperature unless some method is provided for overcoming the superheated top layer.

While too much reliance should not be placed on operating figures obtained as the result of experimental runs, and this remark will apply to those previously given, still as an indication of what may be expected the following results are given:

Out of four heats making monel-metal castings, three showed no metal loss and the fourth heat a loss of 3.3 per cent. The average of the actual melting time was three hours and forty-eight minutes, with a kilowatt-hour consumption of approximately 1300 kw.-hr. per ton (1444 kw.-hr. per t.). The average charge was 549 lb. (249 kg.) with an average electrode consumption of 5 lb. per ton (2.5 kg. per t.).

The results of seven heats making enamel-tank castings under fair operating conditions showed an average metal loss of 3½ per cent, with an average of actual melting time of one hour and forty-eight minutes. The average kilowatt-hour consumption was 537 kw.-hr. per ton, while the electrode consumption was 2.8 lb. per ton (1.4 kg. per t.). The average charge was 580 lb. (263 kg.).

Ten heats were selected from those making red brass castings as representing fair working conditions. The results show the average charge to be 532 lb. (241 kg.), with an average of actual melting time of one hour and fourteen minutes. The average kilowatt-hour consumption was 437 kw.-hr. per ton (485 kw.-hr. per t.) with an electrode consumption of 2.8 lb. per ton (1.4 kg. per t.).

It should be noted that the kilowatt-hours required for making red brass castings are less than those for enamel tank, which simply goes to show that experimental figures cannot be relied on for commercial practice. In order to obtain figures of value full and complete data as to all conditions should be recorded.

Regarding the whole question of labor savings, it can be stated that arrangements have already been worked out whereby pouring castings or blanks direct from the furnace can be accomplished. In the case of small furnaces these can be picked up bodily and brought to the pouring floor, while in the case of the larger-sized furnaces the molds can be arranged to pass under the spout by means of a conveyor system.

It should also be noted that very little use is made of the pyrometer for accurate recording of temperature of melt. "This, in my opinion," said Mr. Miller, "is a mistake and much to be regretted, since the primary object of the use of the electric furnace is to reduce metal losses by more accurate control and to keep full and complete daily records which can be used in determining the best practice and eliminating preventable losses."

ANALYSIS OF ACCIDENTS TO LINEMEN AND GROUNDMEN

Most Accidents Are Avoidable, Chicago Safety Bureau Points Out—Precautions to Be Taken Are Given

An analysis of nearly 6000 accidents to employees of public utility companies in several states shows that a larger percentage of accidents occurred to linemen than to employees in any other occupation connected with electric service. This is probably due to the fact that more linemen were employed by the companies reporting accidents than any other class of men. From a close analysis of all accidents it has been found that a large percentage of them are avoidable. The chief accidents occurring to linemen only are as follows:

	Per Cent
Striking or struck by material	18.8
Electric shock	11.4
Wire, glass, sharp edges	10.0
Handling tools	9.4
Struck by falling bodies	9.4
Lifting or moving material	9.4
Falls from pole	7.3
Acid, solder or compounds	6.0
Fall from elevation (other than poles)	6.0
Fall on level over material	5.4
Injured by spurs	4.0
Fall from vehicle	2.0
Run down by vehicle	0.7
Injured by animal	0.7

Nearly 20 per cent of the accidents occurring to groundmen were due to being struck by falling bodies. Tools should never be thrown up to linemen on poles, nor should linemen drop tools when through with them. A canvas toolbag, securely fastened to the end of the hand-line, should in all cases be used in raising and lowering tools and materials.

The analysis also shows that the majority of the accidents occurring to linemen are not caused by electric current, as is sometimes believed. Thirty-six fatal accidents were found among 2670 reports, and of these twenty-six were caused by electric current (70 per cent occurring to linemen). The remainder were caused by falls, machinery in operation, and heat or gas. Wearing rubber gloves would reduce the hazard of electrical contact considerably, while the use of spurs and safety belts would minimize accidents from falls.

These points were brought out in a recent issue of a bulletin distributed by the Bureau of Safety, Chicago.

The Central Station Industry in War Time

Notwithstanding Terrible Coal Conditions and High Cost and Scarcity of Materials and Labor, It Is Confidently Proving Its Great Economic Value and Its Progress Is Assured

BY WILLIAM H. ONKEN, JR.
Editor ELECTRICAL WORLD

SINCE the war began in Europe so rapid has been the growth of our industry that its kilowatt-hour output has been doubled. The pace, now that the United States has entered the conflict, must be quickened still more because the government needs maximum production in all industries. Every ounce that can be turned out in our mines, mills and factories can be used, and even then it is doubtful if we shall have enough. Co-operation and co-ordination of effort are more essential to the industry now than ever before.

In all parts of the country the labor situation is disquieting and indications are that it will become worse as the war progresses. The trouble is that we are trying to do more work than there is labor to do it with. Ere long we shall have 2,000,000 men in arms, and since it requires at least four times as many men to keep them supplied with food, raiment and munitions, 10,000,000 men will be engaged directly or indirectly in pursuits contributory to the war.

The electrical industry must face this condition with the others and govern itself accordingly. If the entire level of living costs is raised, we must naturally expect to bear some of the burden. Losses in men we shall experience, but we shall be able to operate just the same. Properties in the eastern provinces of the Dominion of Canada have had as high as 35 per cent of their working forces engaged in the war and have managed not only to get on without them but to supply more energy besides.

Fortunately, central stations do not require so large a force of men in their operation as some other industries, so that the irreducible limit of labor may not be reached. There is no danger of shut-down from such a cause, but it is well to recognize that in the world at large labor is of increasing scarcity and that governments as well as private industries must face that fact.

COAL SUPPLY

No other single condition confronting the industry is so serious, and despite all that the government may do, the chances are that it will become worse this winter. Happy is the man with a hydroelectric system.

Coal production has increased but not sufficiently to meet the demand, and the transportation facilities of the country have already broken down. A point has been reached above which prices rise only through competitive bidding against the same sources of supply, sources that cannot be further increased. Such panic-made prices are uneconomic, but wherever production can be increased or a saving accomplished there is a possibility for gain either to the producer or the consumer or both.

Manufacturers of electrical generating machinery are working to the limit on steam turbine units and now large turbines cannot be had in less than two years or more. Roughly speaking, there will be installed by the end of next year 60 per cent more steam generating equipment than there was in existence the first of last year. Huge generators are displacing smaller units; the tendency toward the consolidation of companies and the concentration of supply from large stations is more pronounced than ever, and the industrial world is turning more and more to the central station for power. Moreover, with the larger units and with the better design, great economy in labor has been made possible. The transformation when complete will mean a decrease in fuel consumption per kilowatt-hour generated to about one-half of what it was in 1912.

In 1912 the total coal consumption in a steam station was considered very good if it was as low as 2.5 lb. per kilowatt-hour. To-day generating units as large as 30,000 kw. are in service, with others as large as 70,000 kw. under construction. Steam pressures range from 200 lb. to 250 lb., superheat to 200 deg., and vacuums hover around 29 in. A kilowatt-hour can be generated in a modern station from 10.5 lb. of steam, and the total coal consumption has dropped to 1.5 lb. per unit. When steam pressures have been raised to 300 lb. or 350 lb. and the degree of superheat to 250, further economies may be looked for.

It is surprising what a large saving is made possible

WAR'S EFFECT ON THE INDUSTRY

This paper, presented by Mr. Onken, editor of the ELECTRICAL WORLD, before the Southeastern Section of the National Electric Light Association at Birmingham, Ala., in session Oct. 24 to 26, reviews critically, but with strong faith in the future, the various conditions which the war emphasizes in the central station industry. Among the points outlined in this abstract are the following:

Since the war began in Europe our kilowatt-hour output has been doubled.

We shall experience losses in men, but we shall be able to operate just the same.

The tendency toward consolidation of companies and concentration of supply from large companies is more pronounced than ever.

The cry for power must strike with hollow mockery the ears of the water-power obstructionist.

Immense increases in cost of fuel, material and labor indicate that there must be readjustment of rates.

After this conflict the principle of supply from a central source will be established more firmly than ever, for the war has proved that efficiency of production is more important than accumulated wealth.

by the mere substitution of a modern turbo-generator for less modern equipment in a central generating station. The advance in steam station practice since 1912 has been so great that if all of the electrical energy generated that year were turned out from steam-driven stations, the same output to-day with the apparatus now available could be generated with a saving of at least 15,000,000 tons of coal. To that extent is the central station industry a potential conserver of fuel and a benefactor of mankind.

THE IMPERATIVE NEED OF WATER-POWER DEVELOPMENT

In view of the fact that some 60,000,000 hp. is continuously going to waste in the streams of the country, it is beyond comprehension why an enlightened people like ours should not only fail to encourage but should blindly bar the way to the development of a great natural resource so important to the well-being of the nation. When we consider the benefits which have already accrued to industry from the water powers now developed and recall how we have besought, appealed and pleaded for legislation to permit further development, we contemplate the present unhappy power situation with pain and sorrow. How the cry for power must strike with hollow mockery the ears of the water-power obstructionist!

Be it said to the credit of our industry that it is not content to remain idle. If we cannot build hydroelectric systems we turn to steam stations; but that does not alter the fact that the burning of fuel to produce electricity that might be produced from falling water is not conservation. It is true that notwithstanding obstacles, water-power development has been and is going on.

REFORM IN RATES

Immense increases in the cost of fuel, material and labor indicate that there must be a readjustment of rates. For many years the tendency in the price of electrical energy has been steadily downward in the face of rapid increases in the price of every other human necessity, but when the cost of wire and cable has increased 138 per cent, pole-line hardware 125 per cent, electrical generating apparatus from 30 per cent to 100 per cent, and labor and coal command what the traffic will bear, optimism is no longer possible.

It is, of course, expected of every utility that its management will seek in every way possible, by taking advantage of every advance in the art and by other methods, to maintain the present service at the present rates. When all that can be done has been done toward effecting economies, no commission or court will refuse increases in rates if such are found absolutely necessary. Increases must be applied with discretion, however. In my judgment it would be inexpedient to increase the cost of service to residence consumers.

If the industry can pull through the crisis without having to resort to increased rates, this will redound to its everlasting credit. By co-operation and the interchange of electricity from one system to another through interconnection of systems, further economies are possible with apparatus already installed. No general rule can be applied, however. This much is certain, that in many modern and well-managed utilities profits have been wiped out or even converted into losses, and hence a general upward movement in rates is necessary.

THE FINANCIAL SITUATION

An eminent banker conversant with the public utility field said in 1913 that $4,000,000,000 a year of fresh capital could profitably be used in the development of the electrical industry in the United States for the following five years, and what amount the call for new capital might reasonably be expected to reach after 1918 no one could predict. That estimate must be revised. Right now the industry could use a great deal more than that amount, but even a far less sum cannot be had. The country's offering of billions of Liberty bonds has taken the credit market away from the utilities at the very moment when the demands for service and the need for money are most pressing.

A little exertion in disposing of some of the securities over the counters to private citizens or local banks is good policy, and such holdings would have been the means of saving many a local situation. Cut off from the regular sources of supply, it is incumbent on central station managers to devise ways and means to furnish moneys for extensions and developments for home capital. Many utility companies that have recently tried it find that the interest and dividend moneys which previously went elsewhere and which are now paid to individuals in the communities they serve have had a most salutary effect on all questions involving public relations.

Money will be forthcoming to sustain an industry so vital to a nation as ours. The American people demand good service, advanced and progressive, together with developments which will keep in step with the growth of the country. Fortunately, over-expansion and inflation have been impossible in the central station industry because of high costs and restricted profits. If anything, the industry has not expanded enough.

It is generally recognized that not only is the central station a conserver of fuel, but it is also economical in the use of capital, so that its claims of priority for both fuel and capital are unassailable.

THE PROSPECTS OF A GREATER INDUSTRY

Never in the history of the nation has the central station been in a better position. After this conflict the principle of supply from a central source will be established more firmly than ever, for the war has proved that efficiency of production is more important than accumulated wealth. Electricity has ever been one of the greatest factors in the productiveness of industry, and the central station is recognized as the most economical source of supply.

Establishments operating from isolated plants have been forced by the exigencies of the war to turn to the central stations for added power, or by reason of inability to obtain coal or because of its high cost have been content to let the local lighting company carry their entire load. A transformation that would have normally taken place ten years hence has been brought about almost over night. Having experienced the reliability and economy of central station service, most of these factories will never return to isolated plants. War teaches conservation of energy and resource. Hopeful of serving still more effectively, the industry looks forward with serene confidence to the future.

MAINTAINING RECORDS OF UNDERGROUND DISTRIBUTION

Method Employed by an Eastern Company—Forms of Records Employed—Examples of How Method Is Carried Out

BY M. LABOV

In order to enable the engineers of the Flatbush Gas Company (electrical department) to ascertain quickly and accurately the kind and size of conduit and cable used in any part of their system, and the source of supply, this company has adopted the system of maintaining maps and records described here. To show the underground distribution system a map is used drawn on standard-size sheets 12 in. by 27 in. (30 cm. by 68 cm.), scale 40 ft. to 1 in. (12.2 m. to 2.54 cm.) each street being drawn on a separate sheet or sheets, according to the length of the street. These sheets are arranged alphabetically in a loose-leaf binder which is kept on file in the drafting department. This map designates the location of all manholes, length and number of ducts between manholes and location of lamp posts, etc. When

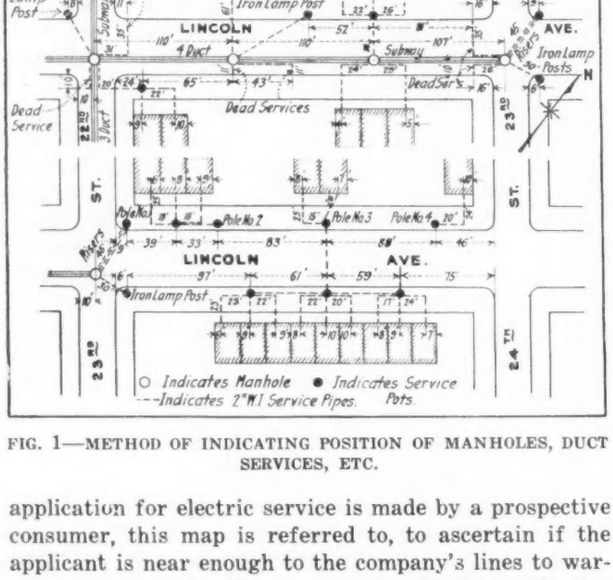


FIG. 1—METHOD OF INDICATING POSITION OF MANHOLES, DUCT SERVICES, ETC.

application for electric service is made by a prospective consumer, this map is referred to, to ascertain if the applicant is near enough to the company's lines to warrant supplying the electric energy. If the application is accepted, a drawing is then made showing the proposed layout of the new service and where it is to be connected to the lines. Copies of this drawing are made and attached to an application for a city permit to open such portion of the roadway and sidewalk as may be necessary to install the service. This method is also used in applying for a city permit to extend duct lines or to build manholes.

A copy of this drawing is given to the foreman of the construction gang, who follows it as closely as the conditions will allow. In case the existing sub-surface structures interfere with the installation of the service in the way the drawing calls for, he is to use his own judgment to overcome the obstacles he encounters. When this work is completed draftsmen make the necessary measurements of the work as it is installed, and these data are turned in to the drafting department to be plotted on the map.

The various sub-surface properties are summed up monthly from these data and subdivided into main and secondary distribution systems, then classified according to the original paving above the installations and added to an inventory which shows the total length in trench feet, the kind and number of various sizes of ducts and manholes, and the trench feet of original pav-

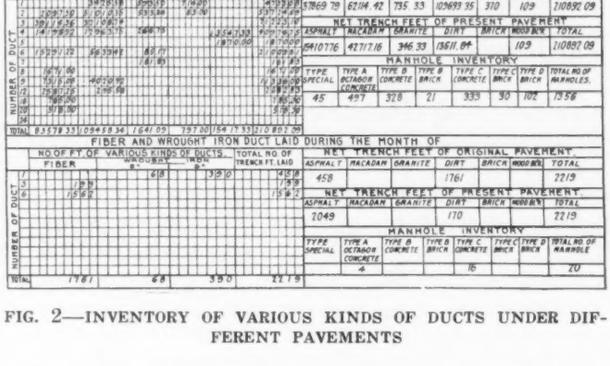


FIG. 2—INVENTORY OF VARIOUS KINDS OF DUCTS UNDER DIFFERENT PAVEMENTS

ing and present paving over duct lines. This is classed as the main distribution system. The secondary distribution system consists of house services, dead or curb services and risers. These data are kept in tabulated form as shown.

The keeping of an inventory for the main distribution sub-surface properties is very simple for the reason that the classification of ducts and types of manholes is seldom changed. It has been found to be very difficult to keep an inventory of the secondary distribution sub-surface properties, because of the fact that they are constantly changing. In Fig. 3 these services are grouped under their respective classes. For example, take the dead-service class, which shows a total number of 827 dead services, and the number of feet of dead services is classed under its respective paving. If five lamp posts are set on five dead services, that changes the dead services into lamp services and five services have to be subtracted from the dead-service class. These are added to the lamp-service class, and the total length of these dead services aggregates 200 ft. (60.9 m.) and

		NO OF FEET OF 2" W.I. PIPE UNDER ASPHALT PAVING.	NO OF FEET OF 2" W.I. PIPE ASPHALT BLOCK PAVING	NO OF FEET OF 2" W.I. PIPE UNDER MACADAM PAVING.	NO OF FEET OF 2" W.I. PIPE UNDER GRANITE BLOCK PAVING	NO OF FEET OF 2" W.I. PIPE UNDER DIRT.	TOTAL NO. OF FEET OF 2" W.I. PIPE	NO OF FT OF 2" W.I. PIPE ON POLES WHICH FEEDS HOUSE OR SERVICE POTS	TOTAL NO OF RISER PIPES ON POLES WHICH FEEDS HOUSES OR SERVICE POTS	TOTAL NO. OF SERVICES
SERVICES		57890	4657	4580	1674	29374	362515	10440	572	5096
DEAD SERVICES		22485	3190	7620		4567	32862	TOTAL NO OF DEAD SERVICES, 827		
LAMP SERVICES		12337	1478	1886	50	2111	18460	TOTAL NO OF LAMP SERVICES 208		
RISERS SIZE	2"	11329	98	501	1897	3987	18045	TOTAL NO FT OF W.I. PIPE ON RISER POLES, 6060	TOTAL NO. OF RISERS, 454	TOTAL NO OF SERVICE POTS, 4559
	1¼	65			195		260	120	6	
	3"	471			72	59	602	360	18	

WROUGHT IRON CONDUIT LAID DURING MONTH OF

Services Laid 1845' in Asph.	220' in Asph Block	2430' in Dirt- Total 4495'	62 Services Laid	9 Service Pots Added
Services Removed 46' in Asph.	63' in Macadam	56' in Dirt - Total 165'	2 Services Removed	
Dead Services Laid	362' in Asphalt	213' in Asphalt Block	877' in Dirt	Total 1852' 31 Dead Services Laid
Dead Services Removed	227' in Asphalt	618' in Asphalt Block	Total 333'	8 Dead Services Removed
Lamp Services Laid	18' in Asphalt	37' in Asphalt Block	Total 153'	2 Lamp Services Laid
Lamp Services Removed	27' in Dirt		Total 27'	0 Lamp Services Removed
Risers 2" Removed	150' in Asphalt	44' in Macadam	56' in Dirt	Total 250' 5-1" Risers Removed
Risers 3" Removed	50' in Asphalt	45' in Asph. Block	23' in Dirt	Total 118' 2-3" Risers Removed

FIG. 3—RECORD OF LIVE AND DEAD SERVICES

is divided as follows: 80 ft. (24.4 m.) in asphalt, 50 ft. (15.2 m.) in dirt and 70 ft. (21.3 m.) in macadam. This amount is transferred from the dead-service class to the lamp-service class.

On the other hand, if a dead service is extended to run into premises a similar transfer is made, but from the dead-service class into the house-service class. Or take

another class, such as risers. These risers connect the overhead with the underground distribution system by cables running through wrought-iron pipe which extend from the manhole to a pole and also up the pole. The number of risers on the pole depends upon the number of cables which are required at this particular part of the line to connect the underground with the overhead system. In this case it is assumed that the pole removed has had three risers on it. The risers are cut off at the butt of the pole, which leaves the remaining part of these wrought-iron pipes lying in the ground connected to the manhole and terminating at the curb These wrought-iron pipes are then placed in the dead-service class, and a transfer is made from the risers to dead service, with the exception of that portion of wrought-iron pipe which extends up the pole, which is removed from the sub-surface property inventory.

At some later date two of these three riser pipes, which are now classed as dead services, are put into operation again. On one there is a lamp-post set, and the other is extended to the consumer's premises where two or more transfers take place.

Commercial Department War-Time Measures

An Analysis of Labor Conditions as They Affect Central Stations in All Parts of the Country, of Economies Now Practiced, and of the Problems Involved in Business Extension

AN INCREASING interest in the steadily accumulating influences of the war upon the central station business is plainly evident. It is bringing up new problems from sources that, though apparently not affecting all utilities at present, will undoubtedly spread across the country long before the war has reached its end—unless good fortune sends peace sooner than military experts anticipate.

The effect of war conditions on the public service company creates a far more complicated crisis than in the case of an ordinary manufacturing or merchandising business. There as costs go up relief can as a rule be found immediately through increased prices. But the central station is denied that privilege in almost every state in the country, except by course of law through an appeal to the governing utility commission. It finds itself beset from two sides therefore—first by the tremendously increased expenses through the higher cost of almost everything that it must buy, and second by the loss of valuable and profitable employees to the national service—at just the time when logically all hands would be buckling down in a concerted effort to increase the revenue by harder work and in that way restore the balance between income and expense as far as possible.

It is plainly evident that the man whose temperamental tendency is to sit tight in times of stress and see what trouble is going to do to him cannot afford to try it now, because his growing costs will eat him up if he refuses to defend himself. On the other hand, the man who in the past has always met attacks by taking the offensive in his own hands with a campaign of creative business building finds that this time things are different, for not only are his forces depleted at the outset, but he must contend with the higher cost of line materials. Besides, indications generally are that his expenses will continue to climb higher. Furthermore, it is more than probable that new selective drafts will call out more and more of his young men into the National Army this year and next year and as the war progresses.

In the past other difficult problems have presented themselves, but generally the answer was to be found in the past experience of others. To-day there is no precedent. European utilities can offer little or no help because of the distinct commercial and service differences. There is one way open, however, and that is in the wider dissemination of information regarding present practice wherever it is found.

With the aim, therefore, of laying the facts before the industry and making accessible the best suggestions which have been developed up to now, the ELECTRICAL WORLD has been in communication with a large number of central stations scattered widely throughout the country and in cities differing in both size and character and noted for their fruitful action in time of emergency. The results, while somewhat meager, are nevertheless stimulating and bring out two striking facts. First, there is a general agreement in theory that the way out lies, not in appeal for higher rates, but through a combination of practical measures of conservation both in operation and administration and an increased selling activity and effectiveness. But in almost direct contrast stands out the second fact—the actual. There seems to be a very widespread tendency as well to accept the higher expenses as inevitable, and for each man to look gratefully upon the fact that so far he has lost few employees and to hope that the industry will find the answer before the lightning strikes that town.

THE EAST AND THE WEST

Every manager who has expressed himself on this subject has shown keen interest, as was to be expected. But Eastern men have said, "It hasn't hit us yet, but we understand some of the Western companies have taken measures." Western men have made the self-same answer, and said that they would be most interested to hear what was happening in the East, "where things were more acute."

As a matter of fact, however, it is well known that the situation is in no way sectional. Expenses have gone up everywhere, and as the war proceeds the meter readers, bookkeepers, accountants, salesmen—men from every department—will be called out. If their places are not filled or their work done in some other manner, then the service will be limited and the income of the company affected. There can be no doubt of the result. Every effort is being bent to save through operation, and the results will loom large in the balance sheet, but

it is equally important that strict attention be paid to the commercial department. A real opportunity lies in taking on more good business, which means more good profits that will pay the war-time costs and maintain needed dividends. The time is ripe, therefore, for every manager to get into action and to whip into shape plans that will prevent even a partial paralysis of growing power, should he be forced to lend his most productive men to Uncle Sam at a time when costs may be still higher.

Various Methods for Economizing

To effect these war economies and help swell the profits from present and added business in the present necessity, different companies have tried different things. In some places monthly meter readings and billing have been discontinued and a bi-monthly or tri-monthly system inaugurated, whereby one-half or one-third of the meters are read each month and billed. This brings immediate relief in these departments not only in releasing employees for other work but also in cutting down the billing expense materially. In other cases while each customer is still billed each month a change has been made to the continuous reading plan, which affords a measure of relief and economy. This system has been in operation for years in some cities. Along kindred lines, other companies have introduced appreciable economies by using post-card bills and thereby saving, in addition to labor and stationery, one cent on each postage stamp. Others have discontinued the return of receipts when bills are paid and begun delivering all bills by boy, making bills for all appliances sold an extra item on the monthly service bill, and in the case of combination companies, combining the gas and electric bills, a saving in each operation from the meter reading on. Others have arranged to have bills paid directly to the bank instead of the company's office.

These are all established practices, though many object to the post card and with some reason. All these measures are mentioned as being considered, however, quite generally as practical expedients. The question is how many man-days of labor and how many dollars can be saved thereby? Can one or two or more employees be shifted by this means from present work to assist in other places where the loss of men is going to bring an urgent need? Can expenses be reduced thereby? Those who are using them find the results practical and up to the needs of the moment.

Another point which many men have pointed out specifically as offering results is in the restriction of expenditures for all line extensions. In one city the company now pays no more than $25 toward the cost of reaching any customer. In another the limit is fixed at $20. In one place the burden of expense entirely is put on the customer for whom the line is run, but for every additional customer who is later taken on the line a refund is made.

A still different plan in successful operation on one system has been devised to divide equitably the cost between customers. Over a line extension, say, to four customers—A, B, C and D—each consumer is charged only with his share of the section of the line he uses. That is, A pays one-fourth the cost of the line between its beginning and his own transformer, because all four of them are using it. B pays his fourth of the line as far as A's house, and one-third of the line from A to B; C pays a fourth to A, one-third from A to B, and also one-half from B to C, the section of the line which he shares with D only. D pays his fourth to A, his third from A to B, his half from B to C, and all the cost from C to D, which he alone is using.

The point is, however, that in these war times the central station is entirely within its rights in practicing a policy of conservation that puts the burden of extensions on the customer. It is clearly a vital issue and one that must be carefully thought out in each community. It is a necessary war measure, but necessitates the greatest tact and justice. One manager covers this phase of it graphically. He writes:

"Our efforts at curtailment in the running of extensions to connect up residences and lighting customers mean that a very considerable part of our time is taken up in refusing such applications and in explaining to the applicant why we are unable to serve him at the present time in such a manner as to make him feel satisfied with a postponement in obtaining service.

"As the number of such applications increases there is a constantly growing number of residents who want service and who have been refused, and naturally they get together and are inclined to become restless and more insistent. They are apt to get their alderman to come into the office with them, which of course makes it a still more difficult matter to turn them down gracefully, and unless they are closely watched a number of them frequently get together and send in a petition to the City Council. Again, such actions are apt to sow the seed which may lead to serious trouble, and as this situation is increasing daily, you will appreciate that a considerable amount of work is required of the salesmen in keeping track of this situation, neither allowing it to grow to proportions which may become serious nor spending money and using material for business which would be very unprofitable and undesirable at this time."

All this is negative, however—an effort to save money. The central station must not stop at conservation. What seems to be needed most is a big two-fisted effort to increase the revenue. This note is sounded from all quarters.

As a special war measure one Southern company has made a concentrated selling campaign to produce small power business and by co-operation with various manufacturers' agents has found new markets for coffee pulverizers and refiners, meat grinders, bone grinders, peanut-butter makers, washing machines, vacuum cleaners, electric carbonating machines, vulcanizers, churns and innumerable similar devices, and in the last three months has sold more coffee and meat grinders, for instance, than have ever been sold by it in a year heretofore. Other companies have set out to build up range sales, land big power "prospects," work out applications of electric heat—one cites the sale of baking and cooking units to restaurant and hotel kitchens—in short, to take hold of this problem in the spirit with which the nation has set to work to win the war.

Meeting the Depletion of the Staff

But it is at this point, of course, that the other horn of the dilemma must be met. What will he do whose staff has been reduced by loss of valuable men into the army? Many have met the urgency by employing

women either as direct substitutes or to relieve a bookkeeper, say, who can be turned into a salesman. No reports have been received of any company that has as yet begun to use women for reading meters, but many are known to be considering it. One company a year ago had nine men in the contract department. To-day all but two employed there are women, the service men having either joined the national forces or been needed more for other work that women could not do so readily. Another company expects to change to women collectors very soon and shift the men to other work. Its manager says, "We do not believe this will detract from the service, but on the other hand expect an actual benefit." And this manager counsels care in the selecting of employees in future to secure either men well below or over draft age or women of sufficient age and character to be settled in their tastes and habits and the kind to take real interest in their work and future progress with the company.

GROWING IMPORTANCE OF EMPLOYING WOMEN

So far the employment of women in the sales department has been general in appliance demonstrating, but many companies contemplate extending their activities to outside selling, though it will largely be experimental, they admit. Considerable confidence is expressed, however, based on actual experience in the bookkeeping, collection, credit, order and complaint departments. One man who has replaced thirty men with women in such capacities states that he has found it necessary to put on three women to care for each two men's work.

There seems to be no difficulty in securing women for this work. Several companies report applications on hand, though in Washington, D. C., it is almost impossible to secure any kind of help, since the government departments have been forced to offer such inducements to build up their fast-growing forces that the city has been swept almost clean of labor. So hard put to it has the local central station been that it has secured the services of the Boy Scouts to deliver bills after school. The boys will work in charge of a scoutmaster and in uniform—a touch of color which will not lack its value in publicity at the same time.

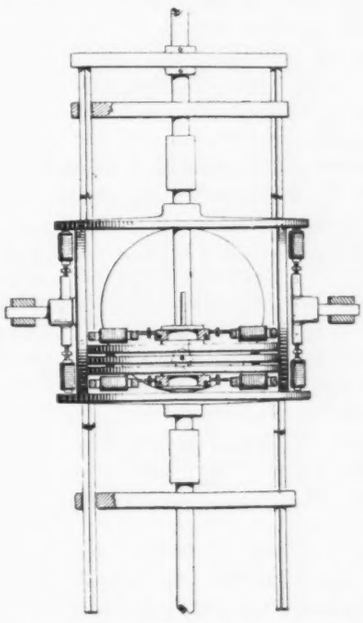
Then there is one more way to meet the emergency—one that several managers have cited as a most effective war measure and one that can easily be adopted. That is, off-peak, year-in-and-year-out business. One company reports an increased sales department that is doubling and tripling all former records for appliance sales. Another has by specializing on the kind of contracts that pay best cut down the cost of doing business quite materially. Another, with a smaller force, has bolstered up the "power to sell" until the department is producing 50 per cent more than before.

Also, in a large number of cases the basis of compensation has been changed from a straight salary to a bonus or commission plan for salesmen and collectors as a war measure to encourage greater sales and less delinquency, and other departments have been included through the fixing of a "bogie" of expense, the saving under which is to be divided on some basis to the interested employees. This has the simple purpose of imbuing the staff with the spirit of personal interest in this win-the-war effort, and it has proved a successful method.

In all, the problem resolves itself into saving wherever possible, particularly labor, and at the same time increasing service. A little paring here and a little saving there, a little more effort in this direction and a little more work in another, will undoubtedly accomplish the desired result.

Electromagnetic Friction Gear

An electromagnetic friction gear which has a differential interlocking arrangement allowing each wheel to turn at a speed proportionate to its respective distance from the driving disk has been patented by J. W. Murray of Moundsville, W. Va. The shaft to which the friction disks are keyed is connected to the driven shaft through a sleeve, permitting shaft, friction disks and electromagnets to be shifted with respect to the other disks making up the gear. This is accomplished by changing the radius of the disk at which they operate through changing the relative speeds. As the friction wears the soft sleeve containing iron filings, the iron filings wear also, thus relieving the pressure from the magnet and at the same time maintaining a very short air gap.



ELECTROMAGNETIC FRICTION GEAR

A similar arrangement can be made using only two disks in contact with four disks. In this case there is a guider to support the magnets instead of rods. In each case, however, power is supplied by the shaft, on the end of which is a disk. This disk is forced against the four disks previously mentioned by magnets. The four disks are forced against the three frictions, differentially interlocked, by another set of similar electromagnets. The middle friction is keyed and is driven by the shaft as mentioned. The arrangement may be reversed—that is, the driving shaft may be the driven one and vice versa. Four disks are in contact with three frictions, giving twelve points in friction contact. The electromagnets are so located that the force supplied is equalized by the friction contact and none is brought to bear on a bearing.

CONVERTING A BREWERY INTO A REFRIGERATING PLANT

How the Steam Equipment of a Plant for Making Beer Was Utilized to Produce Ice and Cold Storage with Central Station Service

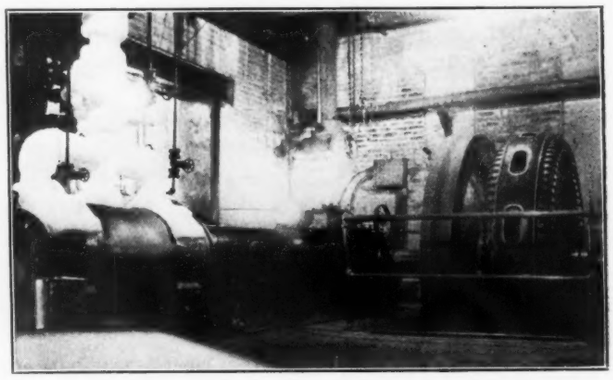
The Gottfried Brewing Company of Chicago, which until recently produced about 400 barrels of beer a day, made an arrangement whereby it consolidated its beer-producing business with that of another concern. This left the former brewing plant free to take up other business. Since the company had been in the ice-manufacturing business in a small way it was decided to expand operations in that time by operating the former brewery as an ice and cold-storage plant. The methods by which the company made use of much of its existing machinery are quite interesting, in view of the fact that brewers in states which have recently "gone dry" are casting about for some other profitable line of business in which their plants and property may be utilized.

The steam plant in the brewery contained a battery of one 307-hp. and two 508-hp. boilers, furnishing steam for cooking and heating operations, as well as for operating machinery. The fact that steam was needed for these industrial heating processes prevented earlier purchase of central station service. With the need for these processes eliminated, the central station became immediately the most economical power source, in spite of the fact that the brewer's power plant machinery was comparatively new. The principal engine-room equipment consisted of two engine-driven generators and some old ammonia compressors. One engine was a 16-in. by 21-in. (46.6-cm. by 53.3-cm.) Lentz poppet-valve unit, rated at 250 hp. and operating at 200 r.p.m. This engine was operating at about 19 lb. (8.61 kg.) of steam per horsepower at full load. It was directly connected to a 200-kw., 240-volt, three-phase, 60-cycle General Electric alternator. The other generating unit consisted of a Lentz poppet-valve tandem-compound 13.5-in. by 23-in. by 21-in. (34.3-cm. by 58.4-cm. by 53.5 cm.) engine rated at 315 hp., directly connected to a Westinghouse 250-kva., 240-volt, three-phase, 60-cycle, 200-r.p.m. alternator. At full load it was developing a horsepower on about 13 lb. of steam. The 250-hp. unit had been installed in 1912, and the larger unit in 1913.

Broadly speaking, the change from steam to electric operation was accomplished by selling the boilers and the old compressors and converting the Lentz engines into compressors driven by the former alternators acting as synchronous motors. In addition to permitting the company to utilize much of its existing equipment, this method of changing also enabled it to begin active operations about one year sooner than it could have begun them if it had been forced to accept the commonly quoted deliveries on new equipment. The two engineering features which made the change feasible were the fact that the alternators could be converted into synchronous motors and the fact that high-speed compressors have now been developed for successful operation.

The change in the equipment was made by removing the steam cylinders bodily from the Lentz engines and replacing them with compressor cylinders. Both engines were fitted with compressor cylinders measuring 15 in. by 21 in. (38.1 cm. by 53.3 cm.). The stroke in each case, of course, remained the same, since no change was made in the engine cranks or connecting rods. These compressor cylinders, when operating at rated speed of 200 r.p.m., will each have a rating of about 140 tons (127 t.) of refrigeration, which is the equivalent of about 90 tons (81.6 t.) of ice per day.

The changes in the electrical end were of somewhat more complicated character. The rotating fields were removed from the alternators and were fitted with "damper" windings to give a squirrel-cage effect at starting. For the 250-kva. Westinghouse machines half-voltage taps were brought out from a bank of three 200-kva., 12,000/220-volt, single-phase transformers served from the Commonwealth Edison system. These half-voltage taps and the full-voltage leads were connected to a three-pole, double-throw switch, so that 110 volts could be used for starting. Owing to the fact that the compressor cylinder is equipped with full-speed by-pass and that the flywheel is small, it is possible to start this machine with 110 volts and bring it near



ALTERNATOR OPERATING AS A SYNCHRONOUS MOTOR DRIVING A COMPRESSOR MADE FROM A CONVERTED STEAM ENGINE

enough to synchronous speed so that the "throw-over" to the operating potential can be successfully made.

With the 200-kw. General Electric machine it was found that, on account of the larger engine flywheel, 110 volts would not be sufficient to start the compressor, even though it too is equipped with a full-speed by-pass. In order to determine what voltage was required to start it, arrangements were made to serve all 12,000-volt central station customers, except the Gottfried Brewing Company, temporarily from another direction. Then the potential on the brewing company's line was gradually raised at the Edison company's substation until it was learned that 150 volts would successfully accomplish the purpose. A compensator designed to give 150 volts at the machine terminals was therefore put in.

In addition to the overload and no-voltage release on the circuit breakers, the machine has been further protected against operating with one phase open by the installation of a new type of relay manufactured by the Associated Engineers' Company, Chicago. These relays are so connected that the opening of any phase at once trips the circuit breaker.

While the new compressors have not been connected on separate meters to give accurate data on their overall efficiency, indications are that the units will be able to produce refrigeration quite economically. The Gottfried Brewing Company is well pleased with their operation. The total connected load at the one-time brewery is now about 1000 hp.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

REMEDYING MOTOR-DRIVE TROUBLE IN RUBBER PLANT

Making a Synchronous Motor Work Satisfactorily After Poor Selection of Gearing Had Caused Trouble

In the plant of the Rubber Regeneration Company, Mishawaka, Ind., there was a rubber mill driven by a 450-hp., 60-cycle, 900-r.p.m., eight-pole synchronous motor. The driving pinion had sixteen teeth. When this machine was started instruments connected with the circuit showed that the load rose and fell in regular periods, increasing with each period until the circuit breaker would go out. It being impossible to operate the machine under those conditions, the synchronous motor manufacturer was called in. He diagnosed the trouble as a case of harmonic load building brought about by the fact that a sixteen-toothed pinion had been selected to run on a shaft driven by an eight-pole machine. The frequency of the motor and of the impulses to the driven machine being too nearly alike created a condition approximating resonance, and this being intensified by the irregularities on the pinion teeth caused the load to fluctuate and increase beyond bounds. The difficulty was finally solved by putting a small flywheel on the set to take up the load fluctuations.

SYNCHRONIZING WITH LAMPS

Demonstrations Indicate That Synchronizing Dark Is More Accurate Than Synchronizing Light

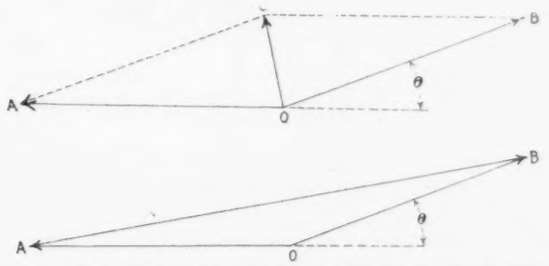
BY FRANK A. ROBBINS

The statement has often been made that synchronizing with lamps dark is not so accurate as synchronizing light, the reason given being that a lamp must have a considerable voltage impressed on it before it begins to glow and that a small reduction from normal voltage can be readily detected. In the writer's opinion the advocates of synchronizing light have evidently failed to consider the phase relations which are shown herewith by vector diagrams for the two cases.

In synchronizing dark the voltage across the lamps is the vector sum of the electromotive forces of the alternators. If *OA* is the electromotive force of one alternator and *OB* the electromotive force of the other, then *OC* is the voltage across the lamps (see Fig. 1). If the lamps are arranged for synchronizing light, the voltage across the lamps is the vector difference (not the vector sum) and may be represented by *AB* (see Fig. 2).

From Fig. 1 it may be noted that even for very small values of angle θ the line *OC* has considerable length. On the other hand, in Fig. 2 the angle θ must have considerable magnitude to cause *AB* to be appreciably shorter than *OA* plus *OB*.

Simple experiments show that the filament of a carbon lamp is barely luminous when 25 per cent of normal voltage is impressed on the lamp, and the filament of a tungsten lamp is barely luminous at 8 per cent of normal voltage. These values are for a well-lighted room. If the room is dark, the figures would be lower. With a carbon lamp there may be a decrease from normal voltage of about 3 per cent before the eye can detect it positively; 6 per cent is necessary with a tungsten lamp.



FIGS. 1 AND 2—VECTOR RELATIONS OF GENERATOR VOLTAGES AND POTENTIAL ACROSS LAMPS WHEN SYNCHRONIZING

Therefore if carbon lamps are used to synchronize dark, the smallest value of θ (Fig. 1) which may be detected may be found by letting *OA* and *OB* equal 100 units each and *OC* equal 2×25 units (since there would be two lamps in series). In this case the smallest angle would be 29 deg. If *OC* equals 2×8 units, the smallest angle that can be detected, using tungsten lamps, is 9½ deg.

If carbon lamps are used to synchronize light, the smallest value of θ (Fig. 2) which may be detected may be found by letting *OA* and *OB* equal 100 units each and *AB* equal $2(100 - 3)$, in which case the angle would be 28 deg. If *AB* equals $2(100 - 6)$, the smallest angle that may be detected, using tungsten lamps, is 42 deg.

When the load on the system is not changing rapidly it is possible to get the machines so nearly in step that the lamps pass through a regularly recurring cycle. This makes it possible to split the dark period, which helps materially in synchronizing by the dark method.

To check the relative advantages of the two methods two machines were synchronized many times by each method. The error in synchronizing was noted by the throw of one of the generator ammeters and also by the position of a synchroscope needle at the instant of closing the switch. It was found that synchronizing dark is somewhat more accurate than synchronizing light when carbon lamps are used and decidedly more accurate when tungsten lamps are used. With the light method carbon lamps are best; with the dark, tungsten.

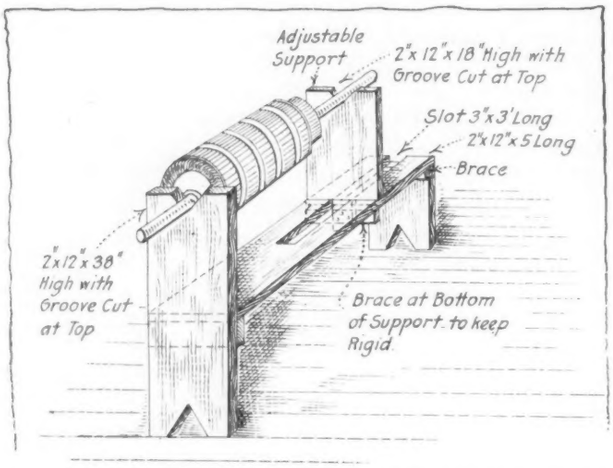
The method of synchronizing dark is opposed by some on the ground that the lamp might burn out during the process of synchronizing, thereby deceiving the operator, with serious results. This objection may be almost eliminated by putting two sets of lamps in parallel and so close together that they may be watched at once.

STAND DESIGNED FOR REWINDING ARMATURES

Rack Has One Adjustable Support Which Can Be Moved to Accommodate Armatures of Various Sizes

BY FRANK HUSKINSON

In the accompanying illustration is shown the detail of an armature stand that can be easily made and which will accommodate armatures ranging in length from


Adjustable Support
2"x 12"x 18" High with Groove Cut at Top
Slot 3"x 3' Long
2"x 12"x 5 Long
Brace
2"x 12"x 38" High with Groove Cut at Top
Brace at Bottom of Support to keep Rigid

THE ADJUSTABLE SUPPORT PERMITS ACCOMMODATING ARMATURES OF DIFFERENT LENGTHS

2 ft. to 5 ft. (0.6 to 1.5 m.). One support is adjustable, being provided with a tongue which slides in a slot in the bench top. This support is self-sustaining as the lower part of the tongue is provided with a cross-piece which prevents the support toppling in case there is any thrust in the direction of the armature shaft. The material used in the stand consists of well-seasoned and planed lumber put together with lag-screws, bolts or nails as desired.

IRON PIPE AS MATERIAL FOR STATION BUSBARS

Experience Shows that for High-Tension Stations It Is Unnecessary to Use Expensive Copper Tubing to Obtain Successful Operation

For the last eighteen months the Central Illinois Public Service Company, Mattoon, Ill., has been using 0.5-in. (1.27-cm.) iron pipe in its indoor 33,000-volt substation for buses and drops to transformers and oil switches. Prior to this time the company had used 0.5-in. (1.27-cm.) copper tubing of iron-pipe size. When the price of copper increased, however, until it cost approximately 50 cents a foot (16.4 cents a meter), while iron pipe cost approximately 5.75 cents a foot (1.9 cents a meter), it was decided that it would be possible to use iron pipe.

While the iron pipe cannot be bent into the desired shapes quite so easily as copper tubing, it can be made to answer the purpose very nicely and can be bent if sufficient care is taken. The chief difficulty in bending the pipe comes from the fact that it tends to break at the seams. In order to give the iron pipe the appearance of a finished job and to permit the pipe to be more easily cleaned, it has been painted with a bronze paint. This not only improves the appearance of the substation interior but also enables the station operator to clean the bus work with less trouble.

Up to the present time all of the iron-pipe installations on the lines of the Central Illinois Public Service Company have been in stations of comparatively small ratings. The largest of any of these stations consists of three 200-kva. transformers connected in delta. It has been the company's experience with installations up to that capacity, according to A. W. Mann, assistant electrical engineer, that iron pipe can be used with entire success on the 33,000-volt side of transformers.

METHOD OF PREVENTION OF CONCURRENT PEAKS

Large Ammeter Visible to Operators in Woodworking Plant Reduces Interruptions Caused by Overloading Motors

BY D. R. SHEARER

Sometimes a manufacturing plant will be found in which the connected motor load is greatly in excess of the plant generating capacity. When such a condition exists there is a possibility that the machinery may be subject to a concurrent peak which will stall the prime movers or in some other way mitigate against normal production. The voltage may drop to a point where the low-voltage releases trip out, thus stopping all the motors and introducing serious delays.

A case of this kind was called to the writer's attention some time ago in a woodworking plant operating a number of machines each subject to peak loads on heavy cuts. It was exceedingly difficult to get the operators to understand the seriousness of allowing a peak to occur on several machines at the same time, and such a condition actually occurred once or twice each day. Each time this happened the manufacturer lost several dollars, so it was determined if possible to obviate the trouble. The blame could never be placed on any one man, and thus it was not feasible to get the desired result through discipline.

The trouble was corrected by placing a large ammeter in plain view of the operators of three of the largest machines. On the ammeter dial, which was printed in large figures and well illuminated, was placed a danger mark, and the operators were instructed never to allow the load to run the pointer above this mark. Since the entire motor load was indicated on this instrument, it was not subject to violent fluctuations, but remained very steady until several machines began to take heavy cuts at the same time, when the pointer gradually moved up toward the danger mark.

There was some fear that the use of this ammeter would curtail production, but this proved not to be the case. In fact, the production was increased, for not only were delays from overloads obviated but the load factor was improved. This is explained by the fact that the men could see when the load was dropping and so could increase the feeding proportionately.

It is possible that the use of an ammeter might be of considerable benefit even in those plants having abundant power by tending to better the load factor and consequently the production of all the machines. If a minimum point as well as a maximum were indicated on the dial and the entire plant load indicated on

the meter, it would appear that great gains in economy might be expected with attendant increase of production simply from the efforts of all the operators to keep the needle in its restricted space on the scale.

TESTING THE LOADS ON DISTRIBUTION TRANSFORMERS

Tests Are Made to Determine Total Load, Phase Balance and Location of Transformer with Regard to Its Load Center

A transformer testing outfit that consists of a split-type current transformer with two windings connected to a low reading ammeter with a 48-ft. (14.6-m.) duplex stage cord is used by the Portland Railway, Light & Power Company of Portland, Ore. Two scales, one for each winding, were calibrated with standard instruments. The low scale has a range of from 5 amp. to 40 amp. and the high scale from 45 amp. to 150 amp. A two-point dial switch mounted on the side of the current transformer is used for changing scales. The contact bar on this switch touches one button before leaving the other, so that in changing from one scale to the other the circuit is not opened.

All testing is done on the secondary side of the transformers, generally in the outside legs only, and in each direction from the transformer. In this way the total load on the transformer is obtained. The conditions of balance between the two sides of the line are shown and also how near the transformer is to its center of load.

In using this outfit it is, of course, necessary to test at night when the peak load is on. It has been found that during the winter months tests could be made over a period of three hours and still be very close to the peak. Two men with a Ford compose the testing crew. One of the men is a lineman, who climbs the pole and clamps the current transformer around the wires, and the other is a tester, who records the readings and directs the work. If the transformers are not too badly scattered, from ten to fifteen can be tested a night.

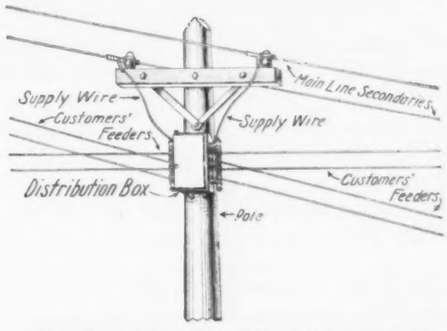
In addition to testing transformers, this outfit is frequently used to test motors and also to test the current in 2400-volt circuits to determine how the current in the three phases was balanced up and to determine the load on a branch circuit. This scheme was brought out by W. C. Heston and R. E. Thatcher at the recent annual meeting of the Northwest Electric Light and Power Association, Spokane, Wash.

IMPROVING APPEARANCE OF DISTRIBUTION LINES

Illinois Company Is Using Panelboard in Cast-Iron Boxes in Order to Insure Construction of a Neater Character

In many cases electric service companies distribute energy for several residences from the same pole, four houses being easily served in such manner under average conditions. In thickly populated districts six, and sometimes eight or more, customers may be supplied from one pole.

Until recently there has been no appliance on the market from which these service wires could be distributed suitably, and the general practice was to use an ordinary pole and cross-arm, as shown in the illustration. On distribution lines of this type it was necessary that the wires should be soldered and taped to the main line and that they should be extended from the pole in several different directions. The usual effect was that the taps were unsightly, and unless work was carefully handled the result was a conglomeration of cross-connected leads, difficult to maintain and incapable of giving satisfactory service. To disconnect a customer's service, when the meter was removed, it was



FOUR SERVICES RADIATING FROM ONE POLE

necessary to cut the service wire and fasten it to some rigid point temporarily. A reconnection necessitated sending a lineman to solder the joint again, which in itself usually added to the unsightliness of the work.

On the lines of the Canton (Ill.) Gas & Electric Company use has been made of a distribution box to give a neater and more satisfactory installation. The box, which is made by the Canton Specialty Company, is placed beneath the main-line cross-arm, and taps from the main line are connected to busbars mounted on a slate panel in the cast-iron box. The service leads are attached to the distribution racks on the side of the box, and enough wire is left on the end of the line to extend through a porcelain thimble to a lug connected with the busbars inside the box. This permits connections and disconnections to be made with a screwdriver, instead of with solder and tape, which not only decreases the time necessary for making connections but also enhances the appearance of the line.

REPLACING GLASS OIL GAGES

Brass Pipe with Small Opening Used to Eliminate Danger of Shut-down

Large generator bearings and other machine bearings made several years ago with exposed and unprotected gage glasses to show oil level constantly invite danger of shut-down owing to breakage of these gage glasses and consequently a burned-up bearing. There is little advantage in having an 8-in. or 10-in. (20.3-cm. or 25.4-cm.) glass to show the level of oil. A brass pipe having a small opening at one side of the proper oil level, with a short piece of gage glass cemented or puttied inside the pipe at the opening, is preferable. This will show the correct height of oil to be carried and will eliminate the danger of a cracked glass causing trouble. This idea was brought out by O. N. Wiswell of the Puget Sound Traction, Light & Power Company, Seattle, Wash., at the tenth annual meeting of the Northwest Electric Light and Power Association at Spokane.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

LIGHTING COMPANY STOPS PERIODIC LAMP RENEWALS

Study of Existing Conditions Showed that Only About 30 Per Cent of Customers Took Advantage of Periodic System Last Year

Another large company in the East, this time the Boston Edison company, has made a change in its free lamp-renewal policy. The Boston company has gone as far as to discontinue entirely the periodic deliveries and will now deliver only on request. Under the old system, which the company has gradually been discontinuing for some time, a lamp-delivery wagon called at regular intervals to renew worn-out units.

A careful study has been made of the old system, and the results showed what was felt to be a very unsatisfactory number of customers taking advantage thereof. The percentage of customers using the periodic system was found to run as low as 17 in some districts, and for the last year has averaged around 30 per cent for the entire territory covered by the system. It was found that the failure to make exchanges was owing partly to premises being closed, partly to indifference on the part of customers or their representatives. The accompanying waste in time, expense and labor was therefore very apparent.

For this reason the old method has given way to the new, which may work in one of three ways: (1) The customer may on presentation of the old lamps at any one of the company's stores or other places designated receive in exchange as before new lamps; (2) the customer may by telephoning or upon written order, definitely stating the number, size and type of lamps desired, receive the lamps by special automobile delivery service and the old lamps will be collected upon delivery of the new, or (3) if the orders are scattered or the places far away, the new lamps will be sent by special delivery or parcel post, in which case the old lamps will be collected later by the company.

The special delivery service has been in vogue for the last four years or more in certain districts and has been found to be generally satisfactory. Under this system a lamp renewal order might stand from a minimum of one day to a maximum of six days, making an average of three to four days before delivery.

The experience of the company shows that under the special delivery system the effective calls average about 80 per cent, and consequently it is of the opinion that the customers feel that they are having better and more direct attention than under the periodic system.

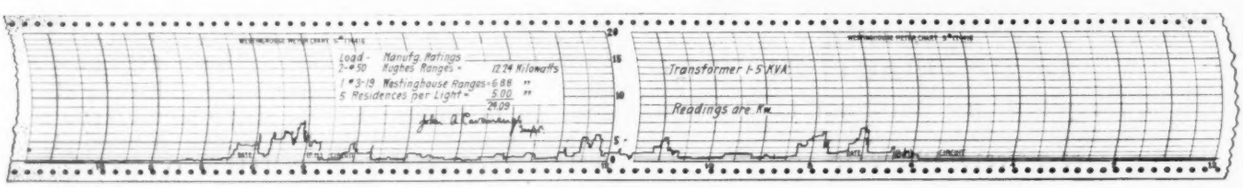
In making the change-over from the old to new system each customer served under the periodic system was notified by a circular letter how renewals could be made hereafter. With each letter there was inclosed an addressed post card for the customer's convenience and use in placing a written order for lamp renewals. There was also inclosed a folder descriptive of the different types and sizes of lamps furnished by the company to facilitate a customer in definitely stating his requirements. With each special delivery package the company incloses an addressed post card, as explained, for the customer's convenience in placing his next order.

DISTRIBUTION TRANSFORMER CARRIES LARGE RANGE LOAD

Five Residences, Including Three Cooking Installations, with a Total Connected Load of 24.09 Kw., Are Served from 5-Kw. Transformer

An investigation of the relation between the connected load and the demand, conducted by John A. Cavanaugh, superintendent of light and power for the Benton Harbor (Mich.) & St. Joe Railway & Light Company, shows that unexpectedly large residential loads may be safely connected to ordinary distribution transformers. At one point on the system of the company five residences are served from a single 5-kw. transformer. The total connected lighting load in the three residences amounts to 5 kw. In addition to this, three families of the five have electric ranges. Two of these are rated at 6.12 kw. each and one is rated at 6.85 kw. This makes a total connected load on the 5-kw. transformer of 24.09 kw.

A load curve taken on Wednesday, Aug. 29, by a graphic meter placed near this transformer is reproduced herewith. It represents the typical condition which exists during most days of the week on the circuit. On the day when this chart was taken a special inquiry was made to be sure that all families were actually cooking on that day. As may be seen from the chart, the peak load on the circuit is somewhat less than 7.5 kw. While this throws 50 per cent overload on the transformer, the duration of the overload is usually less than fifteen minutes except in the evening,



GRAPHIC INSTRUMENT CHART COVERING A PERIOD OF TWENTY-FOUR HOURS

when the transformer carries an overload ranging from 10 per cent to 50 per cent for about forty-five minutes. A study of the load curve indicates clearly the difference in the habits of the families, which leads to the high diversity factor.

AN ANALYSIS OF CENTRAL STATION SELLING POLICY

Specialty Manufacturer Presents Arguments for Aggressive Appliance Campaigns and Is Answered by Utility Sales Manager

Walter E. Ott, district sales manager for the Eureka Cleaner Company, in a paper presented before the commercial men of the Ohio Electric Light Association at Cincinnati, Oct. 10, divided central station selling policies into three groups for analysis. The first group —stations which operate no appliance department— were characterized as thorns in the side of specialty manufacturers. Their lack of direct activity and the apparent apathy of local contractor-dealers deprive the manufacturers of the volume of output they desire in that particular city. New Haven, Bridgeport, Springfield, Mass., Omaha, St. Paul and Dayton were cited as cities in this class which by reason of the central station's inactivity in appliance sales have fewer appliances on their lines than other cities of the same size. People must be made to desire specialties, the speaker argued; therefore electrical appliance sales must be actively promoted.

The second group of stations considered were those which do sell appliances from their stores but do not conduct campaigns featuring goods of some particular manufacturer. Mr. Ott's analysis of this type of company's business is as follows:

> The situation arising is that salesmen of the competitive manufacturers who have their goods on display in the appliance department oftentimes place the central station management in a regrettable position.
>
> We will say that the salesman in the appliance room has just had a talk with a prospective purchaser of a vacuum cleaner. He has shown the various makes on display, yet has favored no particular one, admitting to the customer that they are all good, and, as a matter of fact, stating that one is as good as another. Inasmuch as the salesman has not favored any particular one, the customer is generally "up a tree" as to which is to be preferred. We will say that two particular makes are sent out for trial by the customer, which is a case that often happens. Here the salesmen for the competitive manufacturers enter in, and in a few moments one salesman quickly convinces the customer that his cleaner is so far superior to the other that there is no comparison, and for his efforts he is given the order.
>
> The situation resulting is that the customer comes to the conclusion that very little reliance can be placed in the salesman on the floor of the appliance room, and that in reality there was absolutely no truth in his remark that one was as good as the other.
>
> This policy of not favoring any particular manufacturer in so far as his merchandise is concerned, even though such articles may be far superior both in quality and workmanship to a competitive manufacturer's goods, naturally handicaps the manager of the appliance department in his efforts to increase his appliance business, for the most forceful manner of bringing electrical appliances before the public attention is by what I would call the feature idea. It is solid, logical argument that convinces the public you have something to offer it which is worth while considering before investing in appliances sold by competitive dealers.
>
> From this standpoint it certainly seems advisable for appliance managers to investigate the fields of different electrical devices and, after adopting or accepting particular makes as the best that can be had at the money, to place them before the public and put behind them all the push and energy that the central stations command.
>
> Giving the public logical argument which becomes all the more forceful and convincing as the salesman hammers strongly on the merits of the article the customer is interested in produces a natural tendency for the prospective purchaser to buy more quickly and to feel better satisfied with his purchase. Moreover, that purchaser in talking to friends causes the argument started by the salesman to keep on the move, and more returns naturally come to the coffers of the appliance department.

The third group of companies to which Mr. Ott referred includes those which by aggressive sales methods endeavor to operate a wide-awake appliance department at a profit in the face of competition. He mentions as examples the Consolidated Gas, Electric Light & Power Company of Baltimore and the Toledo (Ohio) Railways & Light Company. Their policy Mr. Ott heartily indorsed as follows:

> Central stations should support and encourage aggressive selling policies. Appliance department managers should profit by the results obtained with the working out of definite selling schemes as illustrated by these two central stations. I urge that they proceed to build up definite sales organizations in the field. I further urge them to resort to catchy and attractive window displays to vary the advertising and make it effective. The latter, to become effective, must be got up bearing in mind that electrical appliances are specialties and not staple goods. To hire and discharge men, as well as to have them resign of their own accord, is expensive. Therefore encourage good men and pay them better. Arrange a scale of commissions for the men in the field; handle honest merchandise, offering it at the most attractive prices; school your salesmen in the respective merits of various articles, and above all things in how to close sales. If central stations with their prestige and capital as a basis will only combine with these initiative, aggression and specialty business principles, I feel that they will see their appliance business grow by leaps and bounds."

AN OPPOSITE POINT OF VIEW

George E. Miller, sales manager of the Cleveland (Ohio) Electric Illuminating Company, in discussing Mr. Ott's paper, said his company had tried selling appliances and had given it up, preferring to devote its energies to the manufacture and sale of electricity and to permit contractor-dealers to do the merchandising business. "Nothing could induce us to change back to the old plan," said Mr. Miller. "We are working in harmony with the electrical merchants and are getting their good will. Moreover, there are now six stores in Cleveland which are carrying stocks larger than we should carry if we were in the retail appliance and wiring business. These firms really have 150 sales representatives that are working for us. This gives an outlet for a greater volume of goods than the company could move. The quality of all electrical goods sold may not be so high as it would be if all were sold from a central source, but the majority of appliances on the market to-day are of fairly high quality."

Mr. Miller also pointed out the manner in which a central station's merchandising activities are likely to be reflected upon the company to its disadvantage. The electric light company when it has a franchise to make and sell electricity possesses a monopoly in the community. If it then enters into the merchandising business, it becomes a competitor of the merchants who have sanctioned the monopoly. Furthermore, if the company conducts cut-price campaigns and de-

ferred-payment sales, the merchants will begin to realize that it is using the strong position its huge capital affords in a kind of competition which they themselves cannot meet on limited capital.

Merchants who compete with the company will naturally deem this unfair, and if they are clear thinkers will attempt to revoke the monopoly privileges which make the unfair competition possible. Mr. Miller concluded by asserting that he had heard merchants seriously discussing this phase of central station merchandising activities, and advised central stations to take this growing sentiment into account.

ADVERTISING SERVICE AT FAIRS AND EXHIBITIONS

Miniature Mechanical Map of System Recommended as Effective Method by Utility in Small Indiana Community

The Indiana Railways & Light Company, Kokomo, Ind., a city of 17,000 or more inhabitants, at Kokomo's fourth annual industrial exposition, filled its booth with a mechanical map 7 ft. wide by 11 ft. long (2.1 m. by 3.3 m.). The miniature cars, nine in number, were moved by means of a motor-driven mechanical device beneath the map, so that the cars traveled from Frankfort on the left to Kokomo at the center, to Marion on the right and then back again, representing the travel of the company's interurban trolley cars. The miniature lamps with poles, lines, etc., connected to a battery circuit represented the company's transmission and distribution system into the neighboring towns.

The purpose of the display was to show the extent of the company's system and at the same time to advertise its railway, power and lighting service. On a

MAP OF LIGHTING, POWER AND RAILWAY SYSTEM OF AN INDIANA COMPANY

small chart at the rear of the exhibit were given the names of the towns on the company's lines, together with the number of customers in each, the amount of industrial horsepower connected and the number of passengers hauled on the railway system. The total attendance at the exhibit was between 50,000 and 55,000. O. M. Booher, manager of the commercial department of the Kokomo company, recommends this plan of advertising for any company which takes a booth at a state fair, county fair or local industrial exhibition, being of the opinion that the results derived are equal if not superior to those that could be obtained by any other kind of exhibit.

CUSTOMER'S METER TAG FOR CONTINUOUS RECORD

Method Whereby Readings for Four Years Can Be Kept as Insurance Against Loss of Records by Utility

Following a fire which destroyed all of the records of a neighbor company, the Bloomington & Normal (Ill.) Railway & Light Company worked out a plan to keep

Meter No.

BLOOMINGTON & NORMAL RY. & LIGHT CO.

BLOOMINGTON, ILLINOIS

YOUR METER READS,

DATE	INDEX	DATE	INDEX
1917 Jan.		1918 Jan.	
Feb.		Feb.	
Mch.		Mch.	
Apr.		Apr.	
May		May	
June		June	
July		July	
Aug.		Aug.	
Sept.		Sept.	
Oct.		Oct.	
Nov.		Nov.	
Dec.		Dec.	

CONVENIENT TAG FOR CUSTOMERS' METERS, SHOWING READINGS FOR FOUR YEARS

from ever getting in the same predicament. The scheme consists of keeping on each customer's meter a tag as shown, bearing the meter number and having space on each side for monthly readings for two years. A complete record of monthly readings over a period of four years is thus contained on this tag. The scheme has the further advantage of permitting the customer to check up his bills at any time he doubts the accuracy of the company's bills. With this plan in effect there is a duplicate record of customer's energy consumption in the company's office and on the customer's premises, and destruction of the office records could therefore occasion no loss of revenue.

The fire in the premises of the neighbor company which set the Bloomington company thinking caused a loss of revenue of $5,000, and the company was fortunate that the sum it lost was no larger. In view of this fact the Bloomington company believes the cost of a single tag for each meter to be a low insurance premium against entire loss of its energy sales records, with all the confusion and inevitable loss of income that such a loss must necessarily entail upon any public service company undergoing it.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

APPROXIMATING THE CURRENT RATINGS IN D.-C. BALANCERS

Notes and Formulas Which Provide Information Designed to Facilitate Handling Estimates for This Type of Machine

IN THE Sept. 28 issue of the London *Electrical Review* there is an article which gives information on approximating the maximum current rating of each machine composing a three-wire balancer set where the balancing unit is also required to act as prime mover to a pair of booster dynamos. When the boosters of a balancer-booster set are to give an output calling for a motoring current exceeding the out-of-balance current in the middle wire, both machines forming the balancing unit will operate as motors and will take between them all the current called for by such conditions from the busbars, the motor connected across the heavily loaded side of the system taking half the difference between the middle wire and booster-motoring currents, and the other balancer machine taking half the sum of the mid-wire and booster-motoring currents.

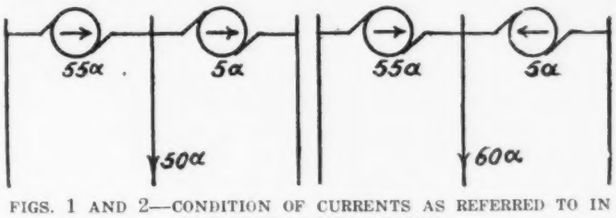
When the out-of-balance amperes in the middle wire exceed the booster driving current, the balancer machine on the more heavily loaded side will act as a generating unit, giving a current rather less than half the difference between the out-of-balance and booster-motoring currents, and the other balancer machine will work as a motor, taking rather more than half the sum of the out-of-balance amperes and the driving current called for by the boosters.

The two machines forming the balancing unit will, of course, as in the case of the plain balancer arrangements, be identical, each being liable to act in its maximum current capacity, according to the specified conditions of out-of-balance and booster loads.

Neglecting balancer difficulty, the current values are—

$C_n = (C_b + C_m)/2$,

$C_o = (C_b - C_m)/2$, or $(C_m - C_b/2$.



FIGS. 1 AND 2—CONDITION OF CURRENTS AS REFERRED TO IN THE TEXT OF THE ARTICLE

These are actual values when C_b is greater than C_m, under which conditions both sides of the balancer are motoring, but when C_m is greater than C_b, the actual current values are:

$C_n = (100C_m + C_bE/(100 + E)$,

$C_o = (C_m - C_b)\ E/(100 + E)$,

when—

C_n = amperes in balancer machine on normally loaded side of neutral wire;

C_o = amperes in balancer on overloaded side of neutral wire;

C_b = motoring amperes in balancer absorbed by booster load;

C_m = out-of-balance amperes in neutral wire, and

E = efficiency of balancer $(100C_o/C_n - C_b)$.

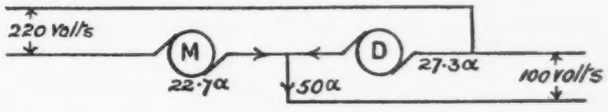


FIG. 3—BALANCER PRINCIPLE AS EMPLOYED IN MOTOR-GENERATOR VOLTAGE REDUCER SET

The value of C_b is, of course, $W_b/E_bE_mV_m0.0001$, when:

W_b = watts output of boosters;

E_b = per cent booster efficiency;

E_m = per cent balancer motor efficiency, and

V_m = voltage across balancer motor,

and may be taken as approximately 5 amp. to 6 amp. per kilowatt of booster output when the voltage either way of the middle wire is, say, 220; thus the motoring current in a balancer working across a 440-volt, three-wire system will be for a booster load of 10 kw. about 50 amp. to 60 amp.

When the middle-wire and booster-motoring currents are respectively, say, 50 amp. and 60 amp., the currents in the balancer will be as shown in Fig. 1, and, neglecting efficiency, the same current values exist with an out-of-balance of 60 amp. and a booster-motoring current of 50 amp., the machine on the side carrying the out-of-balance load in this case acting as a dynamo, as shown in Fig. 2.

When the balancer principle is employed in motor-generator or auto-converter voltage reducer sets, as shown in the diagram in Fig. 3, in which system of connection the secondary current is the sum of the motor and generator amperes, the input current through the motor from the high-voltage side will be:

$C_m = 100\ C_sV_d/V_pE_c$, or $100\ C_sV_d/(100\ V_d + V_mE)$, and the amperes given to the secondary circuit by the generator will be:

$C_d = C_s\ (1 - 100\ V_d/V_p\ E_c)$, or $C_s\ V_m\ E/(100\ V_d + V_m\ E)$, when—

C_m = amperes in motor;

C_d = amperes in dynamo;

V_m = volts across motor;

V_d = volts across dynamo;

V_p = primary supply voltage $(V_m + V_d)$;

C_s = secondary current $(C_m + C_d)$;

E = combined machine efficiency $(100C_dV_dC_mV_m)$, and

E_c = conversion efficiency $(100C_s\ V_d/C_m\ V_p)$.

Neglecting efficiency, it will be seen that the current

through the motor equals $C_s V_d / V_p$ and that the dynamo current is $C_s V_m / V_p$; thus, in the case of a motor-generator working off a 220-volt supply and giving out 50 amp. at 100 volts, the machine currents will be as shown in Fig. 3. And if a combined machine efficiency of 70 per cent is assumed, the motor current will be:

$$\frac{100 \times 50 \times 100}{(100 \times 100) + (120 \times 70)} = 27.2 \text{ amp.}$$

and the dynamo current will be:

$$\frac{50 \times 120 \times 70}{(100 \times 100) + (120 \times 70)} = 22.8 \text{ amp.}$$

It will be found that the actual commercial efficiency —*i.e.*, the efficiency of conversion—works out in the example taken as 83½ per cent.

The balancer system of connection of course offers an advantage only when the voltage reduction ratio is a low one (the advantage being that smaller machines may be used than with the ordinary arrangement of motor-generator having independent high and low voltage circuits), as on the higher ratios of voltage the conversion efficiency is low and the current supplied through the motor to the secondary circuit is too small to be of any value.

Generation, Transmission and Distribution

Modernization of Stuart Street Plant, Manchester.—Owing to the unusual growth of industrial load in Manchester, England, and the necessity of increased fuel economy the Stuart Street plant has been remodeled extensively. The reciprocating engines are giving way to turbines rated as high as 25,000 kw., larger and more modern boilers combined with economizers are being substituted for the old ones, additional coal-handling equipment is being provided, the condensing facilities are being amplified, and the switch gear and busbars are being remodeled. Four of the boilers ordered for this plant are rated at 100,000 lb. (45,359 kg.) per hour, probably the largest contemplated in England, and are single-ended and fitted with both forced and induced draft. Each will have 16 sq. ft. (1.5 sq.m.) of grate area, 14,000 sq. ft. (1288 sq.m.) of heating surface, 7500 sq. ft. (697 sq.m.) of economizer surface, and 5145 sq ft. (48.3 sq.m.) of superheater surface. Jet condensers are being used for some of the units, but owing to the scarcity of cooling water, surface condensers with cooling towers and tank storage are being used for the others. These will be supplemented by new natural and fan draft towers. Large-capacity switches are being installed throughout and the busbars are being sectionalized with reactors.—London *Engineering*, Sept. 7, 1917.

Installations, Systems and Appliances

Dissimilar Transformers in Delta.—J. B. Gibbs.—Formulas giving division of current between banked transformers having different characteristics.—*Electric Journal*, September, 1917.

Mercury Rectifiers for Large Outputs.—S. M. Powell.—Description of iron-clad rectifier and comments on the operations of several commercial installations of this type of equipment.—London *Elec. Review*, Aug. 31, 1917.

Electric Furnace for Brass Melting.—T. F. Baily.—Description of a resistance-type furnace for melting brass and bronze. The furnace is of the non-crucible type and operates on the true resistance principle. The resistance element is contained in a circular trough made of a refractory material similar to carborundum fire sand. In this refractory trough the resistance material, composed of broken carbon, is placed, forming contact with the electrodes, which are placed diametrically opposite each other with their ends protruding into the circular trough. The control of the current, and hence of the furnace temperature and melting capacity, is by means of suitable voltage taps brought out from the secondary of a special transformer supplied with each furnace. Running tests were given of melting bronze and brass, with mechanical tests of the cartridge brass produced and numerous analyses showing the uniformity of the metal at the beginning and end of the cast. The electrical power required shows favorable comparison of melting costs with crucible or open-flame melting furnaces, the average being 450 kw.-hr. per short ton of bearing bronze (495 per metric ton), and 311 kw.-hr. per short ton of cartridge brass (342 per metric ton).—*Met. and Chem. Eng'g*, Oct. 15, 1917, report of meeting of A. E. S.

Electrophysics and Magnetism

Pure Alloys for Magnetic Purposes.—Trygve D. Yensen.—Reasons why pure iron and iron containing elements which do not separate its crystals from each other have great magnetic permeability and low hysteresis losses. Ordinary and vacuum electric furnaces for making the alloys at temperatures up to 1800 deg. C. were also described; also annealing furnaces for heat treatment of the alloys produced.—*Met. and Chem. Eng'g*, Oct. 15, 1917, report of meeting of A. E. S.

Electrochemistry and Batteries

Electrochemical Gasoline.—Louis B. Cherry.—Description of experiments to make gasoline synthetically by electrochemical or electrothermal means. It was predicted that aromatic hydrocarbons such as benzol and toluol (which are in such great demand at present for the manufacture of dyes and explosives) will be made by some modification of the process described.—*Met. and Chem. Eng'g*, Oct. 15, 1917, report of meeting of A. E. S.

Electrolytic Method of Obtaining Solid Iodine from Solution.—L Pisarshevski and S. Tjelni.—In this article the authors give a description of certain preliminary attempts to devise a method of separating iodine electrically from solutions containing iodides, bromides and chlorides. Lead electrodes or a lead anode and a carbon cathode give good results. The lead anode becomes coated with a thin layer of lead iodide, which prevents further combination with the iodine, the latter being deposited in a crystalline crust to remove.—Abstracted from *Transactions* of Russian Phys. Chem. Soc., J. 47, 1915, in *Science Abstracts*, Section A, Aug. 30, 1917.

Lithium in Storage Batteries.—L. C. Turnock.—Description of an investigation made to determine the magnitude of the effect of various additions of lithium hydrate to the potassium hydrate electrolyte of the Edison storage battery. Comparative tests of capacity of Edison storage batteries were made with 0, 10, 20, 30, 40 and 50 grams per liter of lithium hydrate added to the usual 21 per cent caustic potash electrolyte. Test runs showed increased capacity up to 12

per cent with the largest amount of lithium hydrate, in spite of the fact that the addition increased the electrical resistance of the electrolyte 21 per cent.—*Met. and Chem. Eng'g*, Oct. 15, 1917, report of meeting of A. E. S.

Units, Measurements and Instruments

Cross-Current Predeterminations from Crank-Effort Diagrams.—LOUIS ILLMER.—On the basis of principles discussed in this paper, it was concluded that when two alternators are thrown into parallel the resulting cross-current flow, as measured by means of ammeters, will be largely independent of the wheel weight used, except in so far as this weight may influence the character of the regulation rendered by the governor. The difficulty that may be involved in the use of a light flywheel resides in the detrimental secondary effects that may arise. When the ratio of $\beta_o/\beta_x \left(= \sqrt{\frac{s_o}{\pi k}}\, s_a \right)$ (where k is a coefficient depending on the impulses per revolution and s_a/s_o is the ratio of cross-current pull to

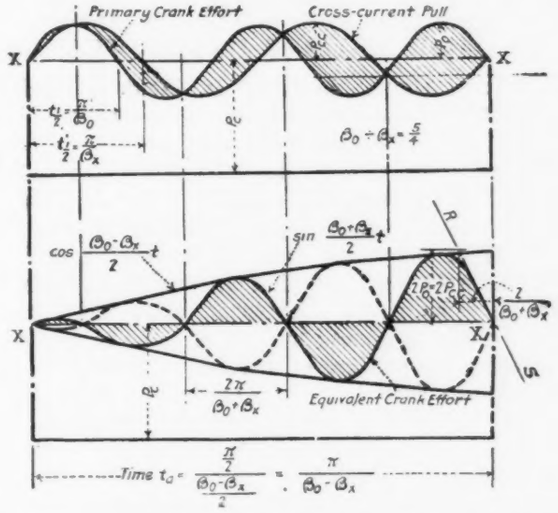


FIG. 4—CONDITIONS LIABLE TO EXIST WITH LIGHT FLYWHEELS THAT CAUSE EXCESSIVE CROSS-CURRENTS

mean crankpin force) is less than 7/2, as is likely to be the case when using a light wheel, the oscillatory peak movement indicated in Fig. 4 becomes about twice as large as would be produced by the use of a heavy wheel. This difference in maximum angular displacement shift may become so marked that the armature working with a relatively light wheel may be thrown far over into the negative or motor position. Such excessive shift in the armature displacement may readily create serious electrical disturbance, for should the angle α_x plus α_o at any time exceed $\pi/2$ electrical radians, *i.e.*, one-half pole pitch, the parallel generators would immediately fall out of step. The best results in parallel operation may therefore be expected when the ratio β_o/β_x is kept as high as 6 or possibly 8. This condition is more readily complied with in the smaller short-stroke engines running at a relatively high speed. However, in order to avoid excessively heavy wheels for the long-stroke, slow-speed engines, it is found advisable to keep the wheel weight in a constant relation to the engine output. The foregoing deductions do not take into account any beneficial effects which dampening coils and like devices may be able to exert upon the cumulative armature oscillations. The purpose of the present investigation was simply to find the most favorable inherent conditions when operating without compensating adjuncts of any kind. The formulas given are further conditioned upon identical constructive characteristics for all the paralleled engine and generator units. Any important difference in this respect may involve a considerable increase in the minimum expected cross-current flow as fixed by the given formulas. Finally, attention is called to the need of properly selecting the coefficient of speed fluctuation for the engine governor. The extent to which the primary speed coefficient may be increased by the cumulative displacements arising in paralleled engine units is indicated by the ratio of s_x/s_o. The governor characteristics should be such that this increased "factor of irregularity" will not throw the governor gear into resonant oscillation with the cumulative wheel period. The use of additional wheel weight is able to effect an important change in the period of the cumulative wheel swing, and this in turn may make it far easier to meet the governing requirements. On the whole, therefore, it may be concluded that owing to the beneficial secondary effects the most satisfactory results in the parallel operation of reciprocating engine units are to be attained by the use of reasonably heavy flywheels, as prescribed. In the foregoing discussion α_o = mean angular displacement lead of the armature as measured in electrical radians; α_x = angular displacement shift of the armature as measured with respect to mean lead position α_o; $s_x = \alpha_x R$ = arc length in feet, corresponding to the armature-displacement shift angle α_x, and s_o = the maximum linear displacement or amplitude of oscillation (in feet).—*Journal* of A. S. M. E., October, 1917.

Telegraphy, Telephony and Signals

Contribution of French Engineers to Long-Distance Telephony with Underground Cables.—DEVAUX-CHARBONNEL.—An account of the work of Vaschy and Barbarat in furthering long-distance telephony, in which it is contended that as far back as 1886 Vaschy had recognized the important rôle of self-induction in telephonic transmission and that some years later Barbarat championed and experimented with the methods known to-day by the names of Krarup and Pupin. A letter written by Pupin to the Academy of Sciences at the time when the academy awarded him the Hébert prize is quoted in which the writer makes a graceful acknowledgment of the inspiration he had received from "French science and particularly from the classic experiments of Lagrange, Fourier and Vaschy."—*Revue Gén. de l'Elec.*, Aug. 25, 1917.

Miscellaneous

Electric Transporters at Munition Factory.—An article giving perspective, elevational and sectional views of two large transporters or cranes used at one of the national projectile factories in England for handling incoming material and outgoing projectiles. They operate over 100,000 sq. ft. (9290 sq. m.) of area at a very high rate of speed. Each crane has a span of 90 ft. (27.4 m.) and an overhang at each end of 45 ft. (13.7 m.). Three motors are employed—one for hoisting and the others for transverse and longitudinal travel.—London *Engineering*, Sept. 7, 1917.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

WATER-POWER DEVELOPMENT NEEDED IN THE SOUTHEAST

At Convention of the Southeastern Section of the N. E. L. A. in Birmingham, Ala., Legislation by Congress Is Urged

The fifth annual convention of the Southeastern Section of the National Electric Light Association was held at the Tutwiler Hotel, Birmingham, Ala., on Wednesday and Thursday of this week. Much interest was manifested in the papers presented, and it was the general opinion of those present that, with the coal situation as acute as it now is in the Southeastern section of the country and with water-power developments loaded to capacity, further water-power development is necessary. The hope was expressed that at the coming session the Congress will enact remedial legislation.

In his presidential address W. E. Mitchell, Alabama Power Company, told of the phenomenal growth of the South industrially and of the rapid increase in water-power development even in districts where coal is comparatively cheap.

Papers and Discussion

The first paper of the Wednesday session was read by W. H. Onken, Jr., editor of the Electrical World, New York. It is printed in abstract on another page of this issue. The portions treating of the coal situation and of the necessity for further water-power development were discussed freely. It was pointed out that coal mines which previously refused to consider secondary service rates are now glad to accept primary service rates. Isolated plants, because of coal shortage, are also seeking central station service. The general seriousness of the coal situation was accentuated, and many managers attended the convention for the sole purpose of ascertaining how other companies are preparing to meet the emergency.

Two other papers were read at the Wednesday session—one on "Safety," by T. K. Selden, American Telephone & Telegraph Company, and another, the "National Safety Code," by P. A. Tillery, Carolina Power & Light Company, Raleigh, N. C. After this the meeting adjourned so that the delegates might see the Liberty Day parade.

Papers presented on Thursday were as follows: "Methods of Handling Customers' Accounts," by H. S. Strong, Birmingham Railway, Light & Power Company; "Effect on Cost of Service of Varying Cost of Fuel, Labor and Supplies," by D. H. Cronheim, Alabama Power Company; "Selling the Electrical Idea," by H. W. Alexander, Society for Electrical Development; "Some Operation and Distribution Problems," by J. O. Harden, Georgia Railway & Power Company; "Selling Securities to Consumers," by C. T. Naumberg, Henry L. Doherty & Company; "Development of the Induction Watt-hour Meter," by M. C. Rypinhki and S. A. Berger, Westinghouse Electric & Manufacturing Company, and "Standardization of Transformers and the Economic Results Obtained from the Installation of Potential Regulators," by L. W. Carnagy, General Electric Company.

A theater party was given on Wednesday evening, and trips to manufacturing plants in Birmingham were made on Thursday. On Friday a special train and boat took the convention to the Warrior River plant of the Alabama Power Company.

PUBLIC SERVICE ASSOCIATION OF KANSAS IN CONVENTION

Twentieth Annual Meeting Is Held at Salina—Commercial and Operating Problems and Fuel Shortage Discussed

The twentieth annual convention of the Kansas Public Service Association was held at Salina, Kan., on Oct. 19 and 20. Meetings were held in the city hall. In spite of low total registration some really constructive work was done through the establishment of working committees. The organization has come to be one made up almost entirely of those interested in the generation and use of electricity. Affiliation with the National Electric Light Association appears to be the next logical step, and a committee, practically with power to act, was appointed to consider further the details of such an affiliation. The convention placed itself on record as favoring this move provided the committee should find it feasible. The local committee, with M. L. Derge of the Salina Light, Power & Gas Company, generously provided entertainment.

Friday's Sessions

The convention was welcomed to Salina on Oct. 19 by P. A. Brown, member of the City Council, who commented upon the need of closer co-operation between public service corporations and city administrations. In response, C. L. Brown of Abilene emphasized the fact that those responsible for the corporations were not unmindful of the need for this mutual understanding and that the up-to-date corporation was willing to meet the city more than half way.

Some time was devoted to a report of the committee on affiliation, H. W. Magruder of Liberal, chairman, to the end that the committee, consisting of H. W. Magruder, P. B. Harbaugh and W. W. Austin, was continued with instructions to report directly to the executive committee for action should this move of affiliation with the National Electric Light Association prove practical.

P. Loyd Lewis, Wagner Electric Company, Kansas City, was on the program for "Just Talk," but his address, directed to the salesmen at the convention, was

something more in that he outlined clearly and entertainingly the functions of the traveling representative as first a business ambassador, next an arbitrator between the customer and the house, then an educator in carrying information from one customer to another, and finally a salesman whose duty it is not only to close contracts for goods already in demand, but to create sales opportunities.

In the discussion the sales representatives, headed by Mr. Cohn, Wesco Supply Company, pointed out that salesmen were not doing their share in obtaining attendance at conventions. Messrs. Reid, Obermeyer and Cohn were appointed a committee to remedy the condition, and it was voted that the nominating committee should nominate at least one vice-president from the salesmen members.

The afternoon session was opened by a talk on "Selling the Idea" rather than the specific equipment by Mr. Harper of the Western Electric Company, another talk of special interest to the sales fraternity.

A. J. Spizzy of Abilene reported for the committee on uniform accounts. The Kansas Public Utilities Commission asked the association to send representatives to discuss it. Mr. Spizzy reported that uniform accounting would be required in the near future and pointed out its advantages. The utilities commission wishes the co-operation of the association. The convention was in favor of uniform accounting and appointed Messrs. Spizzy, Brown and Derge a committee to which companies may go for aid in introducing the system finally prescribed.

R. G. Lafite of Eureka called attention to the critical fuel situation. The convention adopted a resolution calling the attention of Governor Capper and the State fuel administrator, Senator Carey, to the necessity of distributing fuel to electric stations, and appointed a committee, with Mr. Lafite as chairman, to discuss ways and means of insuring an adequate fuel supply to the central stations in the State.

At the evening session the convention was addressed by Harry W. Alexander, publicity manager Society for Electrical Development, New York, on "Winning the Public to Your Side." Mr. Alexander called attention to the following agencies: humanizing the corporation, courtesy, good service, presenting statistics of the industry, investor-customer ownership, explanation of what Wall Street really is, less tendency to hide good deeds, the part politics plays, paid publicity, and free publicity.

SATURDAY'S SESSIONS

On Saturday Prof. C. E. Reid, Manhattan, presented a paper on "The Determination of the Various Losses in Transmission Lines and Distribution Circuits." He presented statistics on typical small transmission lines and distribution systems and explained the method of analyzing total losses to determine the amount that each element makes in the total. While the full-load efficiency of individual elements may be very high, the sum total losses on an all-day basis with unfavorable load conditions may amount to as much as 50 per cent of the energy generated. The need for careful engineering in the layout of these systems was emphasized. Professor Reid favors the establishment of municipally owned transmission lines where conditions are such as at all to warrant their installation, but he cautions both central station managers and municipalities that losses should be taken into careful account before fixing rates for energy.

Prof. George C. Shaad, Lawrence, pointed out that cities have often been disappointed in the financial outcome of transmission lines, and the further introduction of such lines has been retarded somewhat. This has been due to the fact that municipalities have been led to believe that not to exceed 10 per cent of the energy will be lost in transmission, but when the net result of large transformers, small load and poor load factor is considered what looked like a fair financial return has been changed to actual loss. Education of the public, public utilities commissions, station managers, and even electrical engineers, on the nature and extent of distribution losses is needed.

ROUND TABLE DISCUSSIONS

The program provided for a series of "round table discussions" as follows:

"Electric Cooking in Kansas." C. L. Dunn, Salina, outlined what was being accomplished along this line and a short discussion followed.

"Should We at This Time Increase or Decrease Our Efforts to Take on New Business?" W. A. Wadsworth, Wichita, spoke briefly on this subject to the effect that only where a load would tax unduly the ability of the plant to obtain the machinery to take care of it should the efforts to secure new business be curtailed.

"What Is Being Done to Offset Increased Kilowatt-hour Costs?" C. L. Brown, Abilene, outlined the introduction of many fuel-saving devices which, with ordinary prices for fuel, have not always been considered as worth while installing, but which may now be used to very considerable advantage.

"To What Extent Is Iron Wire Being Used for Transmission Purposes, and with What Results?" Prof. F. E. Johnson answered for Kansas by saying that of the 1300 miles of transmission lines in the State about 325 miles is of iron wire, and that it is being used for voltages all the way from 2300 volts to 66,000 volts. Some lightly loaded lines are having trouble because of the excessive charging current and other systems have attempted to transmit more power than the lines were really designed for. Complete and careful tests over a wide range of operating conditions are urgently needed in this class of line.

"What Permanent Effect Will the War Have on Central Station Loads?" L. O. Ripley, Wichita, predicted continued increase in such loads because the central station is the logical source of power for manufacturing plants. In the present stress such plants are turning to the central station, and they are not likely to give up this service.

The technical part of the program was closed with a paper on the subject "The Electrical Range and Its Possibilities for Increasing Central Station Service," by C. A. Meier, Westinghouse Electric & Manufacturing Company.

Officers were elected as follows: President, J. D. Nicholson, Newton; secretary, W. W. Austin; executive committee, C. L. Brown, H. W. Magruder, L. S. Small and Walter Gudy. Oct. 17, 18 and 19, 1918, and Kansas City, Kan., were selected as the time and place of the next meeting.

SIGN LIGHTING DISCUSSED BY NEW ENGLAND COMPANIES

Desiring to Do Their Part in Supporting the War, Many Are Unconvinced that Sign Curtailment Is Economy Worth While

The discontinuance of electric sign service by owners of such equipment is a live topic of discussion at present in the New England States. The fuel committee of the Massachusetts Committee of Public Safety, of which James J. Storrow of Boston is chairman, has informally suggested to various business associations that the present shortage of coal calls for every possible economy in the use of fuel; that New England consumes 40,000,000 tons of coal annually and will be 6,600,000 tons short by Jan. 1 unless the utmost is done to relieve the situation, and that by cutting out electric signs a saving will be effected along most important lines. A representative of the ELECTRICAL WORLD called at the committee's office in the State House on Monday to investigate the matter further after having been in touch with a number of important central stations to ascertain their attitude upon the sign question.

The fuel committee makes no claim that the saving in coal from the shutting down of electric signs would amount to any substantial percentage of the annual consumption of the public utilities concerned, but it holds that even if the saving should amount to but a barge load or two for all New England it would be worth while. The difficulties of the coal situation in New England at present are very serious. Although solid trains of fuel are being brought in, an entire train is able to transport little more than one or two equivalent barge loads at a time. Strong appeals are being made to the federal authorities at Washington to secure the shipment of more coal into New England, and it is felt that the use of electric signs should be discontinued as evidence that everything feasible is being done to conserve the existing supply. Beyond this, the committee is of the opinion that the householder and other private users of fuel will be encouraged toward greater economy if electric signs are cut out of service, and that the psychological effect of dark signs will be such as to bring home to the average citizen the reality of the war economies advocated and the necessity for the utmost co-operation.

Some of the larger central stations in New England have discontinued electric signs of their own in accordance with the suggestions of the committee, but there has been a general feeling among the companies that it is not their province to ask customers to cut out their signs. The Edison Electric Illuminating Company of Boston has discontinued the service of all but two of the company's signs on its lines. One of these is the illuminated tower sign on the company's main office in Boylston Street, Boston. The other sign, which has been greatly reduced in brilliancy, is the famous "clock" sign advertising Edison service near the intersection of Boylston Street and Massachusetts Avenue, in the Back Bay district of Boston. On the latter only the clock dial and essential words calling attention to the company's name and service have been retained in operation. All the co-operative development signs supplied with energy by the company in the suburban towns outside Boston, some twelve or fifteen in number, have been cut out of circuit. The company has also ceased to supply energy on its advertising account to real estate dealers and electrical contractors. The company takes the position, however, that it has no right to ask its customers to discontinue their electric sign service. It has furnished the fuel committee with a list of every electric sign user on its lines and, while regretting the loss of revenue which curtailment of sign service involves, is co-operating as outlined above with the conservation movement. In the October issue of *Edison Life*, the company's official publication for employees, there appeared an editorial emphasizing the point that in Boston, with about 3300 signs in public use, only about 0.7 per cent of the annual coal consumption of the company is represented by this service. The writer of the editorial emphasized the need of cheerfulness in street illumination in these depressing times and held that only the stern necessity of military protection should require the relinquishment of the electric sign.

The Narragansett Electric Lighting Company, Providence, R. I., is of the opinion that a lasting injury will be done the electric sign business by present curtailment. It is believed in Providence that the fuel saving would be so small as to be lost in the station coal consumption records, and very recently a large inter-chimney electric sign erected by the company for its own service at its generating station in Providence has been placed in operation. The Cumberland County Power & Light Company of Portland, Me., is about to issue a notification to its customers that protracted coal shortage may at some future date require curtailed sign service, but so far it has not been necessary to take any steps in this direction. At Springfield, Mass., the United Electric Light Company has considered no curtailment as yet and believes in keeping the service going as normally on the ground that the actual fuel saving is too small to warrant the drastic action of cutting signs out of service or the other unwelcome, and from the company's viewpoint unnecessary, course of asking customers to suspend their sign operation.

The Worcester (Mass.) Electric Light Company has taken no steps looking toward sign reductions and has just installed and placed in operation a sign at the new offices of the company on Foster Street. The interstack sign of the company at its Webster Street station is operating as usual. The executive opinion at Worcester coincides with that at Providence, and the small proportion of yearly energy devoted to sign service is advanced as a sufficient reason for non-curtailment.

The Edison Electric Illuminating Company of Brockton, Mass., one of the Stone & Webster central stations, has seen no need of curtailing sign service as yet, and the movement toward this end is looked upon as controlled by the utmost good intentions but influenced by an undue anxiety as to the effect of signs upon the coal pile. Various companies managed in Massachusetts by Charles H. Tenney & Company of Boston (in Salem, Fitchburg, Haverhill and Malden) have discontinued the use of company signs and ceased the supply of energy to the various board of trade signs in the districts served. On all the properties managed by this organization inside and outside New England the total fuel requirement of the electric signs in service on the lines is less than 300 tons per year. The management of this group of utilities is more favorably inclined toward window and outline lighting than to electric

sign service, and the commercial departments have not attempted to develop sign business to so large a volume of yearly revenue as would otherwise have been the case with these companies.

In sum, the feeling of the New England central stations with which the ELECTRICAL WORLD has been in direct touch during the last few days on this question is that, while every company desires to do its part in supporting the war and is glad in that connection to cut out fuel waste, a good many utilities remain unconvinced that the curtailment of sign service represents any worth-while progress in that direction. It was pointed out by one central station man that the actual effect of cutting down the sign load during off-peak hours might in some cases be adverse to station economy, resulting in a higher rate of fuel consumption per kilowatt-hour than if the load had been retained. There is a general opinion that it is therefore no part of a central station's duty to discourage the use of signs by its customers under present conditions.

THE DEVELOPMENTS IN THE COAL SITUATION

Dr. Garfield Expresses the Belief That Patriotism in the Use of Coal Will Provide All That Is Necessary

Dr. H. A. Garfield, United States fuel administrator, expresses the opinion that if all the people will show the same patriotism in the use of coal which the miners and mine operators are showing in its production, there will be enough coal this year for all war purposes and in addition all that is necessary for domestic industries and for keeping the people warm will be forthcoming.

Reports to the ELECTRICAL WORLD from some sections have failed thus far to confirm rumors of discontinuance of operation of central station companies because of coal shortage, although all indications show that considerable anxiety is felt in many quarters.

Washington reports say that searching investigation will be made by the fuel administrator to determine whether coal hoarding has taken place on a large scale in New York.

It is announced officially that Dr. Garfield will handle the coal problems of each state only through the state administrators. He will return to them all correspondence addressed to him pertaining to conditions in their territory. But in rare cases it will be possible for local bodies or individuals to exercise the right of appeal to the authorities at Washington.

As indicating the difficulties of the present situation, the New England Coal & Coke Company, Boston, has advertised to customers and other steam coal users that earlier in the year, long before any price restriction was made on coal, it contracted for several hundred thousand tons of bituminous coal varying in price from $2.77 to $3.75 per net ton at the mines, subject to any increase in mining rates. "We bought this coal to supply the demands for spot coal and also to be in a position to serve our contract customers in the event of a shortage in our regular coal receipts," the company says.

The federal fuel administrator at Washington, through orders appearing on Oct. 8, does not allow the company to sell this coal at more than $2 per net ton at the mines, although it cost on an average $3.08 per net ton at the mines. The company would be willing, if the government allowed, to sell the coal on the basis of cost at the mines plus the profit allowed by the government of 15 cents per net ton. Among the applicants for coal during two days were included a railway company, an electric lighting company and several gas companies, whose urgent needs could have been filled with this coal at a price satisfactory to all parties, but the company regretfully declined the business on account of the price restriction from Washington.

Homer H. Johnson, newly appointed Ohio coal administrator, who has been investigating the reason for coal shortage, declares that there can be no improvement in the supply for any purpose until a modification is made in the priority order, under which the greater part of the State's production is being sent to the Northwest by way of the Great Lakes.

Mr. Johnson has asked the federal coal administrator so to modify the order that the railroads may use a certain percentage of their cars to ship coal to Ohio points where it is needed and thus keep homes and industries, which includes public utilities, supplied. The railroads were notified to furnish cars for 20 per cent of the coal mined on Oct. 16 to be distributed in Ohio, but so far as can be learned by the correspondent of the ELECTRICAL WORLD in Cleveland very little of that coal has been delivered yet. Reports indicate that the operators did not receive the cars and that the attempt to secure coal in that way practically failed.

Little comment has been made in Cleveland on the report that the government might order all electric sign and other extra use of energy discontinued in order to conserve coal.

The Louisville & Nashville Railroad has been confiscating much of the coal shipped from mines on its lines, its supplies having been practically exhausted during the two months' strike in southeastern Kentucky. Mayor O'Neill of Augusta, Ky., has given orders to a committee to commandeer for the city any coal that may be seized passing through the city so that the municipal lighting plant may have fuel. All over the section similar plants are operating on a hand-to-mouth basis and finding it difficult to get coal. All of the operators state that they are sold ahead for more than two months and have prepared form letters explaining the situation to the increasingly numerous pleading letters which are being received. Although the strike in the southeastern Kentucky field has been over for two weeks, the production has not yet reached much more than 40 per cent of normal.

MILWAUKEE COMPANY INCREASES APPROVED

Wisconsin Railroad Commission Gives Authority for Higher Rates for Steam Heating and Electricity for Large Consumers

A petition of the Milwaukee Railway & Light Company for authority to increase rates for steam heat and electrical energy to large consumers has been granted by the Wisconsin Railroad Commission. It is stated that the increases average about 22 per cent. They are based directly on increased cost of operation due to higher cost of coal and labor.

FEW CHANGES MADE IN THE NATIONAL ELECTRICAL CODE

Several New Committees Appointed to Take Up Important Subjects—Chairman Cabot Resigns —Next Meeting to Be Held in 1920

Very few important changes were made in the National Electrical Code by the electrical committee of the National Fire Protection Association at its twenty-first annual meeting on Oct. 23 and 24 at New York City. The meeting was shorter than usual, lasting only one day and a half, but was well attended. About 150 were present. Chairman Cabot, who has presided for about twenty-five years, announced his resignation at the end of the meeting. A vote of appreciation and gratitude for his able leadership during these many years was given. A successor to Chairman Cabot has not yet been named.

Recommendations of Electrical Committee

Five recommendations were proposed by the electrical committee: (1) That a committee of five be appointed to consider the use of lead-covered cables for extensions in fireproof buildings; (2) that a special committee of five be appointed to draw up additions to the code to take care of apparatus under 50 volts; (3) that a committee of five have power to re-edit sections of the code to eliminate class D; (4) that the next edition of the code be known as the 1918 edition, to be ready by Jan. 1, 1918, and that the next meeting be held in 1920; (5) that a committee of five be appointed to be known as the "new system and devices committee." The latter committee will investigate all new systems and devices, referring them to the Underwriters' Laboratories, which will make the necessary tests and investigations and refer them back to the committee. The above recommendations are to be carried out.

Wiring of Power Stations and Substations

Recommendations in the report of the committee on the wiring of power and substations were accepted almost as presented. The new paragraph on the subject of isolating lightning arresters, which formerly read "on circuits of over 7500 volts," was changed to "all arresters." Several changes were made on recommendation of the committee on induction motors. In Section c of Rule 8 the first sentence of the second paragraph suggested was changed to the following: "Except for auto-starters, the switch called for in the preceding paragraph may be omitted where the motor starter disconnects all wires of the circuit. Where auto-starters are used a switch must be provided on the supply side of each auto-starter. Where the starter, when in the running position, automatically opens under overload it may serve also as a circuit breaker." Several other minor changes were made in this report.

The report of the committee on circuit breakers was withdrawn.

Several changes were made in suggestions made by the committee on cabinets. Under the rule on outlet-junction and flush-switch boxes, Section a was finally amended to read as follows: "Junction or pull boxes having not more than 150 cu. in. [2400 cu. cm.] contents, outlet boxes and flush switch boxes must be of pressed steel not less than 0.078 in. [1.98 mm.] (No. 14 U. S. sheet metal gage), or of cast metal having wall thickness not less than ⅛ in. [3.2 mm.]."

Recommendations offered by the committee on transformers were accepted, as was the report of the committee on electric signs.

Grounding Committee Report

The committee on grounding presented a supplementary report dated Oct. 17, 1917. This was adopted after several changes. In the rule on wires, an amendment was agreed to, reading as follows: "Metal conduit containing service wires must be grounded, as provided in Rule 15A, except under the following conditions: (1) Conduits containing no conductors of circuits except 150 volts to ground may be left ungrounded if insulated from the ground and from the metal conductors, metal raceways or armored cable systems within the building and from all other work on or in the building. (2) Conduits containing conductors of circuits exceeding 150 volts to ground may be left ungrounded if insulated as above and also isolated or guarded."

A change was also made in the rule on fixtures, under the subject of grounding, so that it would read as follows: "Insulating joints and canopy insulators may be omitted in the following cases: (1) Straight electric fixtures in which all wires have an approved rubber insulation not less than 3/64 in. [1.19 mm.] in thickness, metallically connected in a permanent and effective manner to metal conduit, armored cable or metal molding system or to gas piping, provided such gas piping is grounded in the manner described for conduit in Rule 15A, (2) straight electric fixtures in which all wires have an approved rubber insulation not less than 3/64 in. [1.19 mm.] in thickness, connected to knob and tube, wooden molding or open work, except on metal ceilings or on plaster walls or ceilings containing metal lathing; (3) straight electric fixtures in which all wires have an approved rubber insulation 3/64 in. [1.19 mm.] in thickness which are permanently and effectively grounded to a separate ground wire not more than No. 14 B. & S. gage; (4) combination fixtures in which all wires are of approved rubber insulation not less than 3/64 in. [1.19 mm.] in thickness and where gas piping is grounded, as in Section 1 above." The present rules are to stand until 1919, when the foregoing will take effect. This is in order to allow fixture manufacturers, especially those who make decorative types, to change fixtures to comply with the ruling.

This committee also recommends that as soon as practicable the rules be further revised with the idea that grounding may be extended to all utilization devices, including sockets, fixtures, receptacles and even portable devices; that all of these devices be so made in the future that the casing, shell or covering may be grounded when used with polarized circuits, and that manufacturers, jobbers, contractors and all interested be asked to co-operate in securing the above results with as little delay as possible. The committee further recommends that the Underwriters' Laboratories, Inc., be more severe in its specifications and tests on "approved ground clamps." The committee also recommends that ground clamps be made only of copper and not less than 1/16 in. (1.6 mm.) in thickness, that no

iron or steel be used in any part of the clamp except that a steel clamping bolt may be used, and that the lug to which the wire is soldered or fastened by an approved connection be an integral part of the clamp.

FUSES, SWITCHES AND METER INSTALLATIONS

In the report of the committee on fuses, switches and meter installations, Rule 23 on automatic cut-outs (fuses and circuit breakers), Section a, caused considerable discussion and the wording was returned to the secretary for revision. The main idea in this section, it was decided, was that all meter installations be placed together to make a workmanlike arrangement and not be scattered over various parts of a building. In the rule on switches a paragraph was rearranged to read as follows: "Service switches must be arranged to cut off the entire current from all circuits and devices, including meters, except as provided in the following paragraph. Where service fuses and meter are combined in an approved single self-contained unit device having no exposed wiring or live parts and no parts not protected by the fuses, the switch may be so arranged or installed that it will not disconnect the meter from the supply line, provided it does disconnect all lines of the supplied house circuits."

The report of the committee on electric heaters was adopted as recommended.

SWITCHES AND CUT-OUTS

The report of the switch and cut-out committee was adopted with a few changes. Regarding the rule on refillable fuses a notice was read that the suit brought last March by the Economy Fuse & Manufacturing Company of Chicago has been withdrawn. The committee reported: "In view of the misinterpretation placed on the report of the committee in the March bulletin regarding refillable fuses the committee desires to submit the following revised report: On evidence presented to or obtained by the committee, it does not recommend any changes in Rule 68d, but presents this report with the understanding that in order to obtain additional field experience, municipal and underwriters' inspection departments may permit a continuation or extension of the use of such refillable fuses as have, in their opinion, been shown to comply with tests and specifications for cartridge fuses and to be suitable for use."

TABLE 2—MINIMUM SPACING (IN.) FOR SWITCHES OTHER THAN ON SWITCHBOARDS

Ampere Rating	125-Volt., D.C. or A.C. Opp. Pol.	125-Volt., D.C. or A.C. Break	250-Volt., D.C. or A.C. Opp. Pol.	250-Volt., D.C. or A.C. Break
30	1¼	1	1¾	1½
60	1½	1¼	2¼	2
100	1½	1¼	2¼	2
200 to 300	2¼	2	2½	2¼
400 to 600	2¾	2½	2¾	2½
800 to 6000 inc.	3	2¾	3	2¾

Ampere Rating	250-Volt., D.C. or 500-Volt., A.C. Opp. Pol.	250-Volt., D.C. or 500-Volt., A.C. Break	600-Volt., D.C. or A.C. Opp. Pol.	600-Volt., D.C. or A.C. Break
30	1¾	1½	4	3½
60	2¼	2	4	3½
100	2¼	2	4½	4
200 to 300	2½	2¼	4½	4
400 to 600	2¾	2½	4½	4
800 to 6000 inc.	3	2¾	4½	4

Several minor changes were made in the classification and marking of switches with a rating of over 1000 amp. Table 2 on spacing was rearranged, as shown herewith. It was also added that switches above 1000 amp. should not be used for breaking the current but only as disconnecting switches.

In the report on cut-outs, Rule 67, slight changes were made and the recommendation was voted for.

MISCELLANEOUS SUGGESTIONS

Under the suggestions in miscellaneous items, the majority were returned with no action. Several important recommendations are given herewith. Under the rule on motors, a new paragraph was finally adopted to read as follows: "Alternating-current motors operating freight or passenger elevators or cranes, that are dependent on phase relation for the direction of rotation, must be protected by approved automatic circuit breakers (or reverse phase relay), operative in the event of any phase reversal that would cause a reversed motor rotation or in the event that the motor be connected in the line single-phase." In Section d of this same rule the first sentence of the suggested change in the second paragraph was taken out. In Section a of Rule 23, on automatic cut-outs, fuses and circuit breakers, the amended second paragraph was returned with no action. Several suggested changing this as in the 1913 code, but were not supported.

On the subject of interior conduits a committee with power to amend the ratio between conduit and wires was appointed to prepare a report for publication in the 1918 edition of the code. This committee consists of Messrs. Wynkoop, Peet and Forsyth.

On motors the amendment was made to read as follows: "Must each be provided with the name plate, giving maker, capacity in volts and amperes, and full-load speeds at interval duration, which operate safely, starting cold. Time interval given must be either 5, 10, 15, 30, 60 or 120 minutes, or continuous." This ruling does not apply to motors in railway use.

On the subject of switches an amendment was made as follows: "Must be supported at outlets where possible by ⅞-in. [2.25-cm.] blocks fastened between studs flush with the back of lath except where approved fittings or outlet boxes which will give proper support are used. When this cannot be done wooden-base blocks, not less than ¾ in. [1.9 cm.] in thickness, securely screwed to lathing must be provided."

A new rule was added to the code to be known as 37A concerning electrically operated organs. This applies to the electrical control of the sounding apparatus and keyboards.

PUBLIC POLICY COMMITTEE CONSIDERS WAR PROBLEMS

Meeting in New York Is Devoted to Consideration of Questions Affecting the Industry in War Time

A meeting of the public policy committee of the National Electric Light Association was held in New York on Oct. 19. A general discussion of the war-time problems of the industry took place. This included discussion of the fuel situation in which the industry finds itself, the question of sign lighting, and similar problems created by the stress and the industrial requirements incident to the war.

JOVIANS IN WAR-TIME BUSINESS CONVENTION

Fifteenth Annual Convention in New York Devoted Mainly to Business Sessions—Amendments to the Constitution

With attendance and proceedings tempered by the war conditions, the Jovian Order held its fifteenth annual convention at the Hotel McAlpin, New York, on Oct. 22 and 23. In keeping with the times the convention was shorn of many of its usual entertainment features and to a large extent was a strict business gathering. The principal work done was the adoption of amendments to the constitution. In the main they are intended to make possible a campaign for bringing the non-Jovian electrical leagues within the fold and then to strengthen the relation between the parent organization and the various leagues.

The convention program was opened by a luncheon at the Hotel McAlpin given by the New York league to the visiting Jovians. James M. Wakeman, general manager of the Society for Electrical Development, presided as toastmaster. The Rev. Wallace Petty made a stirring patriotic address which aroused great enthusiasm.

The convention was called to order by Reigning Jupiter Henry L. Doherty, who asked Henry Harris of Pittsburgh to take the chair. Mr. Harris presided over the sessions as he has done for several years. Mercury Ell C. Bennett read a letter from Edward N. Hurley, chairman of the United States Shipping Board, to Mr. Doherty in acknowledgment of an invitation to address the convention. Mr. Hurley was unable to be present, but he expressed keen appreciation of the work of the Jovian Order and of the effectiveness of such co-operative measures in building up the great electrical industry.

Mr. Doherty, in lieu of a formal address, explained briefly the necessity for holding a business convention notwithstanding war conditions. He told his hearers that they would be surprised if they knew how many of their associates are serving the country not only through enlistment but through the sale of bonds and in other ways giving from 1 per cent to 100 per cent of their time.

Address of Mr. Lieb

At the opening session on Tuesday John W. Lieb, chairman of the National Committee on Gas and Electric Service, made an address outlining the work which that organization has done to assure co-operation of the utilities with the government in all matters relating to the prosecution of the war. Early in the course of this work, said Mr. Lieb, the question was raised as to whether the committee would be of assistance in solving the fuel problems of municipal plants as well as of privately owned plants. Mr. Lieb said that the position was taken that the committee was in existence primarily to render a patriotic service to the government, and in the pursuance of that purpose it would make no difference whether a utility was municipal or private.

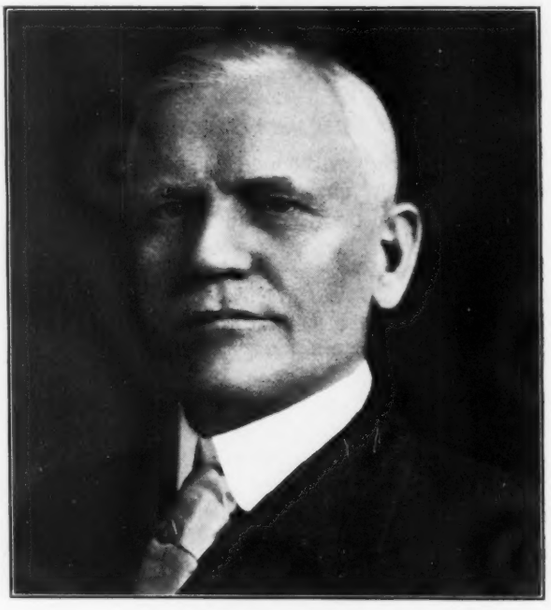
Lynton T. Block, Utilities Indemnity and Fire Exchange of St. Louis, explained in detail the new insurance plan of the order.

The amendments were adopted at the afternoon session with some changes made after discussion on the floor. One of the principal contests was over the method of nomination and election of congressmen and statesmen. It was decided to substitute for the amendment offered in the report a provision permitting contests by candidates for whom petitions are presented twenty-four hours before the election. To induce non-Jovian leagues to charter and, as at present organized, to bring into the order rapidly their entire membership, the initiation fee to the Jovian Order is to be waived from Oct. 24, 1917, to Feb. 1, 1918; on and after the last-named date the initiation fee will be $5, one-half to be retained by the local Jovian organization holding the initiation and the balance remitted to the central office.

The report of the committee on resolutions, of which Charles A. Newning was chairman, included the accompanying pronouncement concerning the war, which was adopted by a rising vote.

J. F. Strickland, Jupiter

The report of the nominating committee, presented by W. N. Matthews, St. Louis, named the following, who were elected: J. F. Strickland, president Texas



JUPITER-ELECT STRICKLAND

Power & Light Company, Dallas, Tex., Jupiter; Ell C. Bennett, St. Louis, Mercury.

Mr. Strickland was born on a farm near Gadsden, Ala., and went to Texas as a young man. First a farmer and later in the mercantile business, he afterward entered the electrical industry through the purchase and control of the electric light plant at Waxahachie, Tex. In this enterprise Osce C. Goodwin and M. B. Templeton were connected with him. Later they extended operations and bought control of other companies in the same district. They acquired the Hillsboro Gas & Electric Company, the Cleburne Gas & Electric Company, the Bonham Gas & Electric Company and the Sherman Gas & Electric Company. When Mr. Strickland moved to Dallas the Dallas Securities Company was formed to hold control of the operating properties. Mr. Strickland and his associates built the Texas Traction Company, an interurban line extending between Dallas and Denison. Later they or-

ganized and built the Southern Traction Company, extending between Dallas and Corsicana and Dallas and Waco. In the latter part of last year the interurban properties were consolidated as the Texas Electric Company. When the Texas Power & Light Company was organized to take over the lighting properties of the Strickland-Goodwin syndicate it acquired also other properties and has been enlarged considerably. One of the recent principal activities of Mr. Strickland has been the acquisition of a franchise in connection with C. W. Hobson for the Dallas electric railway and electric properties.

JOVIAN PLEDGE TO WIN THE WAR

For the first time within the history of our order, it meets under the shadow of a great war in which our nation is engaged as one of the participants. It is, we believe, fitting and proper that we should define in unmistakable language the attitude of this great organization toward our nation in this great struggle.

For nearly three years our nation has been the target for abuse, insult and degradation at the hands of an unscrupulous power, blind with the lust of conquest by war and including our people in its path of destruction. Stinging under the lash of insults to our nation, we finally threw off our apathy and entered the great contest entirely from principles of humanity and for the preservation of the liberties that we have so long possessed. That our nation did right in entering this war we declare and affirm, and we further pledge the resources of our great order in men, money and influence to the support of our nation in waging this great conquest for liberty.

We ask and demand that our members, wherever located and however situated, give of their time, their money and their labor to our nation in this struggle. We must not only measure our patriotism in dollars, but we must give all that we possess in brains, energy and devotion toward this most sacred cause in which we are now engaged. This requires sacrifice upon our part, and we ask and request that every member make this sacrifice. The life of our order, the liberties of our people and the existence of our nation depend upon this sacrifice that we must make.

There is no place for the slacker in our membership. There is no excuse for shifting responsibilities, and we expect that every member will give all that he possesses that is good, if necessary, for the winning of this struggle. We stoutly affirm and maintain that we want no peace until that peace shall come stripped of the lust of power and blessed by the humanity of men one to another. In this national convention assembled, we pledge to our nation and its officers our lives, our means and our power to win this war for right.

We further request that this resolution be not only spread upon the minutes of our order but that a copy be sent to each league with a request that it be brought to the attention of every member, and, further, that a copy be sent to those in charge of our national defense, and that the pledge that we have made herein be kept with honor.

Congressmen and statesmen elected were:

MEMBERS OF THE CONGRESS

First District—William R. Phipps, Brush Electric Company, Galveston, Tex.

Second District—Joseph Insull, General Electric Company, Pittsfield, Mass.

Third District—Harry W. Alexander, Society for Electrical Development, New York.

Fourth District—Arthur G. Pierce, Cutler-Hammer Manufacturing Company, Pittsburgh.

Fifth District—T. J. Creaghead, Louisville, Ky.

Sixth District—Julien Binford, Jr., Westinghouse Lamp Company, Atlanta, Ga.

Seventh District—W. R. Power, Consolidated Heat, Light & Power Company, Huntington, W. Va.

Eighth District—Galen Crow, Public Service Company of Oklahoma, Guthrie, Okla.

Ninth District—L. O. Ripley, Kansas Gas & Electric Company, Wichita, Kan.

Tenth District—Henry N. Remington, Central Illinois Light Company, Peoria, Ill.

Eleventh District—William T. Wallace, Idaho Power Company, Boise, Idaho.

Twelfth District—H. L. Woolfenden, Allis-Chalmers Company, Denver, Col.

Thirteenth District—J. N. Colkitt, John A. Roebling's Sons Company of California, Los Angeles, Cal.

STATESMEN

Arkansas—C. J. Griffith, Little Rock Railway & Electric Company, Little Rock.

Arizona, California, Nevada—Lewis E. Sperry, New York Insulated Wire Company, San Francisco.

Idaho—Ernest C. Kiersted, Idaho Power Company, Boise.

Illinois—L. C. Spake, McGraw-Hill Publishing Company, Chicago.

Indiana—Wallace O. Lee, Indianapolis Light, Heat & Power Company, Indianapolis.

Iowa—H. W. Garner, Des Moines Electric Company, Des Moines.

Kentucky—J. B. Riley, Westinghouse Lamp Company, Louisville.

Louisiana—W. A. Porteus, Western Union Telegraph Company, New Orleans.

Maryland—J. G. Livingston, Southern Electric Company, Baltimore.

Massachusetts—C. B. Burleigh, General Electric Company, Boston.

Minnesota, North Dakota, South Dakota—W. H. Vilett, Sterling Electric Company, Minneapolis.

Missouri—Fred Johnson, Wagner Electric Manufacturing Company, St. Louis.

New Jersey, Delaware—James Howlett, Elizabeth.

New Mexico—J. A. Shepard, Deming Ice & Electric Company, Deming.

New York—E. G. Hines, ELECTRICAL WORLD, New York.

Ohio—N. H. Boynton, Cleveland.

Oklahoma—Charles McCallum, Western Electric Company, Oklahoma City.

Oregon—A. S. Moody, Pacific States Electric Company, Portland.

Pennsylvania—George H. Criss, Pittsburgh.

Rhode Island—E. R. Davenport, Narragansett Electric Light Company, Providence.

South Carolina—W. W. Fuller, Isle of Palms Traction Company, Charleston.

Tennessee—C. J. R. Watson, Electric Supply Company, Memphis.

Texas—Hiram O. Clark, Houston Lighting & Power Company, Houston.

Utah—Charles H. Talmadge, Western Electric Company, Salt Lake City.

Vermont—E. E. Larrabee, Twin States Gas & Electric Company, Bennington.

Virginia—Guy E. Seiler, Virginia Railway & Power Company, Richmond.

Wisconsin—Carl Golin, Northwestern Storage Battery Company, Milwaukee.

Province of Alberta—Norman S. Richards, Northern Electric Company, Calgary.

Province of Manitoba—J. H. Schumacher, Schumacher-Gray Company, Ltd., Winnipeg.

Province of Quebec—E. N. Hyde, Northern Electric & Manufacturing Company, Montreal.

MR. DOHERTY ON SIGN LIGHTING

At the banquet which closed the convention on the evening of Oct. 23 talks were made by Sam A. Hobson, Frank E. Watts, W. N. Matthews, Henry L. Doherty and Dr. Talcott Williams, dean of the School of Journalism of Columbia University.

Mr. Doherty spoke of the movement to save coal by curtailing the utilization of energy for electric signs. Every war, Mr. Doherty declared, is more or less a problem in psychology. The present war is bound to be very largely one of psychology. The confidence, or lack of confidence, on the part of the various opponents may prove in the end to be the determining factor.

G. H. STICKNEY ADDRESSES CHICAGO SECTION, I. E. S.

War-Time Work of Illuminating Engineering Society and Recent Developments in Incandescent Lighting Are Summarized

Without stating specifically what the Illuminating Engineering Society is doing to assist the government, G. H. Stickney, president of the society and illuminating engineering assistant to the sales manager of the Edison Lamp Works of the General Electric Company, Harrison, N. J., gave the Chicago Section of the society on Oct. 18 a fixed impression that valuable service is being rendered. Before taking up his subject, "Recent Developments in Incandescent Lighting," Mr. Stickney expressed the opinion that factory-lighting codes which have been adopted and are being considered in several states would become the order of the day in every industrial state in the Union before many more years elapse.

Speaking of incandescent lamps, Mr. Stickney stated that one or two improvements had been made in the last year. In addition to the improvements, a number of changes have been made necessary by the war. The lamp companies' engineers have been faced by many problems brought about by the increasing prices of certain chemicals and the decreasing qualities of others. The speaker stated, however, that detailed discussion of the engineering problems which must be faced in lamp manufacture was not encouraged by the manufacturing companies' engineers on account of the fact that lamps may be said to be still in the development stages. The manufacturing companies' engineers, wishing to avoid all necessity of manufacturing special lamps, have thought it wise not to talk about lamp specifications.

One of the problems which lamp companies are facing on account of the war is the largely increased use of carbon lamps. About two years ago the carbon lamp was practically a dead letter. Of late, however, it has been coming back to a considerable extent. Just what the real cause is the speaker could not say, but he indicated that the difficulty might be attributed to the fact that the companies' educational program was not meeting with entire success.

Better store lighting, Mr. Stickney declared, is the keynote of all lamp work for the year. He expressed the belief that industrial lighting is lagging somewhat, although this is not particularly true of the Chicago territory. As the greatest development in industrial lighting in the year he pointed out the new type of unit which employs a silvered metal cap fitted tightly to the lamp bulb to reflect the rays against a dishpan-type reflector and entirely screen the filament from the eye.

On protective lighting it was difficult for the speaker to go into details on account of the fact that owners of most installations have requested secrecy. Protective lighting had been of three general types, post lighting, lighting from corners of buildings and floodlighting. In the latter the plan which arranges all the lamps to play in the same direction was particularly favored. As present trends in street lighting the speaker pointed out the use of single lamps instead of cluster standards, the movement toward standards of more ornamental design, most of which incidentally require that the lamp tip upward, and the use of stippled glass in connection with refractors to accomplish desirable distribution and diffusion at the same time. Another trend which from the lamp manufacturers' standpoint is interesting is the use of more massive fixtures. It has been discovered that such fixtures will dissipate heat easily and permit the lamps which operate at high temperature to run cooler, even though the fixture be unventilated and the lamp could be operated in a ventilated fixture of less massive design.

Regarding colored lighting, the speaker indicated a belief that lamps of higher efficiency are creating a real demand for color modification. Light users can now afford color effects. The difficulty of getting certain materials because of the war is retarding development along this line. Mr. Stickney declared the carbon-dioxide lamp to be the most accurate medium for color matching. In such places as silk mills these lamps have no effective competitors. In other places, where the demand for a high degree of accuracy is less consistent, there are many types of color-matching units which will give adequate results.

Perhaps the most spectacular development has been in the field of projection. The moving-picture lamp has arrived, and while it is not suitable for the theaters of larger cities, it will displace arc-lighting equipment rated at as much as 35 amp. direct current or 60 amp. alternating current. The lamps are made in two sizes with ratings as follows: 30 amp., 25 volts, and 20 amp., 30 volts. The life of these lamps is 100 hours.

DISCUSSION

Prof. E. H. Freeman, who presided at the meeting, suggested the use of unidirectional floodlighting for one-way traffic streets. On broad thoroughfares the light from lamps on one side might be directed in one direction and that from those on the other side in the other direction. James R. Cravath urged the use of more stippled glass, but cautioned engineers to be on guard aaginst glass of this type with edges which were too sharp and hence apt to accumulate dirt.

Mr. Stickney, in answering questions, stated that it was impossible to make automobile lamps conform more nearly to a standard dimension as regards the focal length. The reason is that glass cannot be worked to greater accuracy than $\frac{1}{8}$ in. (3.2 mm.). He also stated that he did not believe colored light of the future would be produced by lamps with colored bulbs, since it would be more economical to use colored screens of gelatine or glass. The possible exception may be in lamps of the more common color. The yellow-bulb lamp, he said, had been held up because of a disagreement as to just what yellow should be employed. He stated that he knew of no satisfactory dips for use on type C lamps.

Electric Distributing System for Charleston Government Plant

Sealed proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until 11 a. m. on Nov. 5, and then and there publicly opened, for an electric distributing system at the naval projectile plant, Charleston, W. Va. Drawings and specification No. 2657 may be obtained on application to the bureau or to the commandant of the navy yard or naval station named. F. R. Harris is chief of the Bureau of Yards and Docks.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month on the next-to-last text page.

Fall Meeting of Electric Power Club.—The fall meeting of the Electric Power Club will be held Nov. 12, 13 and 14 at Hot Springs, Va.

San Francisco Electrical Development and Jovian League.—At the Oct. 10 meeting of the league John F. Neylan, former chairman of the State Board of Control, spoke on "Facts and Figures on War Costs."

Chicago Section of the I. E. S.—G. H. Stickney, president of the Illuminating Engineering Society, addressed the Chicago Section of this society on the subject of "Recent Development in Incandescent Lighting" at the meeting held on Oct. 18.

"The Engineer at the Battle of Verdun."—Captain G. P. Capart of the French General Staff addressed the Schenectady Section of the American Institute of Electrical Engineers on the subject of "The Engineer at the Battle of Verdun" on Oct. 23.

The Electrical League of Cleveland.—Prof. J. L. Borgerhoff, present head of the foreign language department at the Women's College, Western Reserve University, addressed the Electrical League of Cleveland on the subject of "Belgium Before the War and Now" at a meeting held on Oct. 18.

Philadelphia Section of the Illuminating Engineering Society.—"Economies in the Operation of Large Lighting Installations" was the subject of a paper presented by Clarence L. Law and James E. Buckley at a meeting of the Philadelphia Section of the Illuminating Engineering Society held Oct. 19.

Jovian Electric League, Los Angeles.—James W. Gerard, former United States Ambassador to Germany, spoke at the Oct. 10 meeting of the Jovian Electric League on the "Urgency of Liberty Loan Subscriptions," and was followed by City Attorney Stephens, speaking on the same general topic. The annual election of officers was held at this meeting. Harry N. Sessions, of the Southern California Edison Company, was elected president.

Quarter Century Club of the General Electric Company.—The "Quarter Century Club" of the General Electric Company, composed of employees who have been with the company twenty-five years or more, recently met and donated $1,750 as a "comfort fund" for the old Second, now the One Hundred and Fifth New York Regiment, of Schenectady and neighboring cities. This sum will form the nucleus of a fund to be placed in the hands of Col. J. W. Andrews and to be spent at his discretion for the aid and comfort of the soldiers from this vicinity. A large percentage of these men are employees of the General Electric Company. At the conclusion of this business the members of the club, at dinner in the General Electric restaurant, devoted the evening to the second Liberty Loan, listening to addresses by President A. L. Rohrer and G. E. Emmons.

Philadelphia Section, Association of Iron and Steel Electrical Engineers.—The November meeting will be held Nov. 3 and will be known as the "General Ideas and Discussion" meeting. Every member has been requested to prepare a ten-minute paper on any subject pertaining to the application of electricity to the iron and steel and allied industries. It is suggested that papers be prepared, not only on technical subjects, but also on subjects such as apprentice systems, stock-room methods, cost systems, piece work, etc.

Chicago Engineering Societies' Meetings.—The tentative program of the Chicago Section of the A. I. E. E., with which is affiliated the electrical section of the Western Society of Engineers, has been arranged as follows: On Oct. 22 Lieut.-Col. L. D. Wildman was to speak on "The Engineering Problems of the Signal Corps"; Nov. 25, Bert H. Peck, "Engineering Data for the Determination of an Electric Rate Problem"; Dec. 27, joint luncheon meeting with Electric Club-Jovian League; Jan. 27, Thaddeus Baily, "Electric Furnaces"; Feb. 24, Professor White, University of Michigan, "Electrochemical Processes"; March 24, "Railway Electrification"; April 28, joint meeting with American Society of Mechanical Engineers; May 26, F. A. Vaughan on "Regulation of Street Series Lamps," at a joint meeting with the Illuminating Engineering Society.

New Jersey Utilities Association.—For the third annual convention of this association, meeting Oct. 26 and 27 at Atlantic City, N. J., this program was scheduled: "The Proper Relations Between Public Utilities and Public Utility Commissions," by Ralph E. Donges, president Board of Public Utility Commissioners of New Jersey: "The Problem of Higher Operating Costs and Commission Control of Rates," by Dr. Thomas Conway, Jr., professor of finance, University of Pennsylvania; "Public Utilities Doing Their Bit," by J. L. O'Toole, Newark, N. J.; "Interrelation of Various Obligations for Adequate Utility Facilities Under War Conditions," by George W. Fuller, consulting engineer, New York City, N. Y.; "The Financing of Public Utilities," by T. H. Dudley Perkins of Bioren & Company, bankers, Philadelphia; "The Binding Force of Term Contracts, with Special Relation to Public Utility Rates," by Ralph J. Baker, Harrisburg, Pa.; "The Valuation of Intangibles for Rate-Making Purposes," by Dr. F. Herbert Snow, chief engineer Public Service Commission of Pennsylvania; "Utility Troubles—Their Causes. Effects and Remedies," by W. H. Roth, Philadelphia.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Minimum Rate in Indiana Decision.—The Indiana Public Service Commission has handed down an order in the case of the Indiana Power & Water Company, which has its central station at Edwardsport, Ind., fixing new rates in many southern Indiana towns and cities. The order in general reduces primary rates to electric consumers at Petersburg, Dugger, Bloomfield, Worthington, Odon and Elnora, and provides a slight increase at Bicknell. The latter action places Bicknell rates on a par with those of the company at Vincennes, where operating costs are practically the same as at Bicknell. The commission's order raised the minimum monthly charge for small consumers at Bicknell from 50 cents to 75 cents; at Petersburg this charge was lowered to 85 cents from the former charges of $1 to $1.50; Dugger minimum charges were lowered to 85 cents; at Bloomfield, where there had been no minimum before, a minimum of 85 cents was established; at Worthington the minimum was increased to 85 cents; at Odon the minimum was made $1, and at Elnora the minimum fixed was $1 monthly. The small consumer primary rate readjustments, when applied generally, will result in average decreases of from 5 to 15 per cent, the commission announced. These schedules were accompanied with the promulgation of a uniform schedule of power rates. The company's territory is in the Indiana coal fields and the low power rates are promulgated to give an impetus to the movement to substitute electricity in the operation of the mines. The company operates in about twenty towns. The commission announced that it had established the minimum charges on a basis of the population of the towns served and their consumption of electricity and also, in a few instances, that the question of the accessibility of the towns to the distributing and generating center had been taken into consideration. The action of the commission in readjusting the rates had been taken with a view to help the company develop its business. In justification of the minimum lighting charges promulgated, the commission points to the contention of the company that it costs $1.40 a month to serve each individual customer. The order shows that the patrons of the company in the various municipalities "stand receptive to improved service and rate reductions, but if they are to enjoy said benefits it is also incumbent on the comparatively few patrons adversely affected to bear the slight changes that are adjudged to be reasonable."

Preferred Stock Sold by Colorado Company.—The Colorado Power Company has sold to Denver bankers $100,000 of 7 per cent cumulative preferred stock, which is being offered at par and dividends.

New Director of California Railway & Power Company.—Lyman P. Hammond of Bonbright & Company has been elected a director of the California Railway & Power Company, increasing the directorate to twelve members.

Station Operating Committee, O. E. L. A.—The station operating committee of the Ohio Electric Light Association, of which Henry B. Dates of Cleveland, Ohio, is chairman, will hold its open meetings as follows: Nov. 14, Columbus, Gibson Hotel; Jan. 18, Cleveland; March 13, Dayton; May 15, Toledo.

Private Energy Supplants Municipal Lighting.—The Village President of Fredonia, N. Y., has been authorized to contract with the Niagara & Erie Power Company for electric lighting for the streets, parks and public buildings. The contract will continue for five years. The municipal electric light plant will be discontinued.

Electric Furnace Activity in Northwest.—There are now eight electric furnaces in operation in the Puget Sound district of Washington, all engaged in the reduction of steel scrap. Two of these are of 3-ton capacity, the others being smaller. Several other electric-steel reduction works are in process of construction and more are contemplated. General interest in the electrical phases of the industry in that quarter is manifested.

Colorado Power Company Acquires Competitive System.—Acquisition of the business of the Gem Electric Company, successor to the Boston-Colorado Electric Company, operating as competitor of the Colorado Power Company in the Idaho Springs district, is reported by the Colorado Power Company. The Colorado Power Company acquired only that part of the distribution system which was necessary for carrying on the business. Lines duplicating the system already operated by the Colorado Power Company were removed.

Chicago in the War.—E. W. Lloyd, general contract agent of the Commonwealth Edison Company of Chicago, who is devoting his entire time to his duties as assistant secretary of the Illinois State Council of Defense, described the activities of the council at the weekly luncheon of the Electric Club-Jovian League on Oct. 11. He gave figures to show that so far the Chicago district, which includes the northern part of Illinois and a small portion of Wisconsin, has sent about 90,000 men to the war, contributed four times as many Red Cross members as were asked of it, contributed twice its quota to the Red Cross fund and oversubscribed its allotment of the first Liberty bonds y more than $100,000,000. Mr. Lloyd said it nettled him a little to hear people say that Chicago is lagging in war activities.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Power Purchase in California.—The Sierra & San Francisco Power Company has filed with the California Railroad Commission a supplemental application for authority to pay out of the proceeds of the sale of $1,000,000 first mortgage bonds hitherto authorized by the commission $450,000 for the La Grange division of the Yosemite Power Company. The bonds were authorized in October, 1916, by the commission, to pay for additions and betterments. The Sierra and Yosemite companies have filed applications for the transfer of the property, which was approved.

Change in Control of Cuba Power Company.—Vice Consul George B. Starbuck, Cienfuegos, writes that all the interests of the Cienfuegos Electric & Power Company have been taken over by the Cienfuegos, Palmira & Cruces Electric Railway & Power Company. The purchasing company (until about a year and a half ago practically the property of an American) was organized under a charter of the State of Maine and is said now to be owned and controlled by H. Upmann & Company, Havana, Dr. Julio de la Torre, acting for Dr. Orestes Ferrara, also of Havana, and Cardona & Company of Cienfuegos.

Cities Service Directors Declare Increase in Stock Dividends.—The directors of the Cities Service Company on Oct. 17 declared not only the regular cash and stock quarterly dividends of 0.5 per cent on the common stock, payable Jan. 1, 1918, to stockholders of record Dec. 15, 1917, but also the Feb. 1 dividend. At this date the stockholders will receive a stock dividend of 0.75 per cent (9 per cent per annum), thereby increasing the disbursements in the form of stock by 3 per cent per annum, and as well the 0.5 per cent cash dividend. The regular 0.5 per cent cash dividend on the preferred stock was likewise declared.

Electricians Wanted in the Army.—The United States Army needs electricians and men of many other trades such as iron workers, automobile mechanics, etc., to serve in the army along the lines of their civilian occupations in this country and abroad. Enlistment is open to citizens of the United States or to those who have declared their intention of becoming citizens. They must be between the ages of eighteen and forty-five years and have no one depending on them for support. Men who can qualify for the above positions will be examined physically at recruiting headquarters, 357 Broadway, New York City. Military training is not required, nor are strictly military duties exacted except in emergencies.

Federal Government Needs Stenographers and Typewriters.—The United States Civil Service Commission announces that, owing to the present emergency and the urgent need for eligibles, examinations for stenographer and typewriter and stenographer or typewriter, for both men and women, will be held on each Tuesday until further notice, at a great many places a list of which may be obtained from the commission at Washington. Vacancies in the departmental service, Washington, D. C., will be filled from this examination. The usual entrance salary for this position ranges from $900 to $1,200 a year. These examinations have been modified. Full information in regard to the scope and character of the examination, including sample questions, is contained in Form 1424, "Information for Applicants for Stenographer and Typewriter Examinations."

Signal Corps Appeals for Lenses for Aircraft Cameras.—Citizens able to do so are asked to help the Signal Corps of the army get lenses enough for cameras for the fleet of observation airplanes now being built. German lenses can no longer be bought in the open market, and pending the development of a substitute by the Bureau of Standards, which is under way, hundreds are needed at once. Possessors of the following types are urged to notify the photographic division of the Signal Corps, United States Army, Mills Building Annex, Washington, D. C., of the price at which they are willing to sell: Tessar anastigmat lenses, made by Carl Zeiss, Jena, of a working aperture of F. 3.5 or F. 4.5, from 8¼ in. to 20 in. focal length; Bausch & Lomb Zeiss tessars, F. 4.5, from 8¼ in. to 20 in. focal length; Voigtlander Heliar anastigmat lenses, F. 4.5, 8¼ in. to 24 in. focal length.

Civil Service Examination for Laboratory Assistant.—The United States Civil Service Commission announces an open competitive examination for laboratory assistant, for men only, on Nov. 7 and 8, 1917. Vacancies at the United States Navy Yard, Washington, D. C., at entrance salaries ranging from $3.28 to $4.48 per diem, depending on qualifications of appointees, and in positions requiring similar qualifications will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer or promotion. It is especially desired to secure eligibles who are qualified to do laboratory work in the Model Basin, where ship models are tested for power and hydrodynamical investigations in connection with the resistance and propulsion of ships are carried out. The laboratory work will also include aerodynamical investigations carried on in the Wind Tunnel in testing models of aeroplanes, dirigibles and other aircraft. While previous experience in either of these two lines of work is desirable, such experience is not necessary, as applicants who have a good engineering education can qualify easily. Applicants should apply for Form 1312 to the Civil Service Commission, Washington, D. C.

Samuel Riebel, engineer at the power plant of the Commonwealth Electric Company, Summit, N. J., for fourteen years, has resigned.

Clarence E. Salisbury, assistant manager of the North Coast Power Company, Vancouver, Wash., has enlisted in the ordnance department of the army and has left for Eugene, Ore.

Sidney G. Vigo, who formerly had charge of the commercial work of the Middle West Utilities Company, Chicago, has been made assistant to the vice-president of the American Public Service Company, with headquarters at Dallas, Tex., in charge of operation, commercial and other departments of the company.

Maurice E. McCormick has resigned as assistant general manager of the Bangor Railway & Electric Company to become assistant general manager of the New Brunswick Power Company, St. John, N. B., Canada. Mr. McCormick had been connected with Bangor (Me.) property for twenty-three years, having worked up to the position he held at the time of his recent resignation.

Everett Morss, president of the Simplex Wire & Cable Company, Boston, has been appointed a member of the priority committee of the Council of National Defense. Mr. Morss is widely known in the electrical industry and has been connected with the Simplex company for thirty-two years. He is a graduate and member of the executive committee of the Massachusetts Institute of Technology.

Hugh L. Cooper, noted hydraulic engineer, New York City, who received a commission as major in the Engineering Corps of the United States Army, has reached France safely and is now engaged in active service. Mr. Cooper is vice-president and chief engineer of the Mississippi River Power Company and was chief engineer of the company's large low-head hydroelectric development at Keokuk, Iowa.

Louis D. Eckard, who for some months has been engaged as superintendent of construction of a copper mine in Alaska, has recently been appointed assistant general manager of the Alaskan Light, Heat & Power Company, with offices at Seattle. Mr. Eckard before going to Alaska was connected with the Philadelphia Electric Company in the distribution and station construction department.

Frederick Bedell, professor of applied electricity at Cornell University, has been serving on a government commission charged with establishing government schools in military aeronautics. Professor Bedell is widely known for his electrical engineering textbooks and for his research in alternating-current phenomena especially as affected by wave forms. Professor Bedell is managing editor of the *Physical Review* and has had a wide experience as a member of important commissions. At the last annual meeting of the American Institute of Electrical Engineers he was elected one of the vice-presidents of the Institute.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

M. H. Flexner, of the power division of the Commonwealth Edison Company, Chicago, has accepted a position with the Booth-Hall Company, manufacturer of electric furnaces in the same city.

Cloyd Hunt, who has been associated with the Minneapolis General Electric Company for several years, has been appointed manager of the newly created Southwestern division of the Northern States Power Company, with headquarters at Montevideo, Minn.

R. J. McClelland, chairman of the Hydroelectric Section of the National Electric Light Association and chief

R. J. M'CLELLAND

engineer of the Electric Bond & Share Company, is receiving congratulations on his marriage on Oct. 13 to Miss L. W. Hendrick of Washington, D. C. Mr. McClelland was born in Iowa in October, 1878. He went to Iowa University and later to Stanford University. He was graduated in 1905 with the degree of B.S. from Union College. Previous to that time he had several years of experience, including a year in the field with Stone & Webster on the Pacific Coast in hydroelectric and transmission construction. For a while he had charge of all of the electrical work on what was the first third-rail system on the Pacific Coast. This line was from Seattle to Tacoma and was for the Puget Sound Electric Company. Mr. McClelland spent some time on the west coast of Mexico in the electrification of old Spanish silver mines and on the light and power supply for Mazatlan. He also had previous experience in hydroelectric and transmission construction in Montana in 1900 on the old Madison River plants. In 1906 he acted for some months as general manager for the hydroelectric and transmission system in and around Pocatello, Idaho. He joined the Electric Bond & Share Company in November, 1906, shortly after the formation of the company and has been connected with it ever since. He has for a number of years been chief engineer in charge of all extensions, improvements, expenditures, consultations and purchases. Mr. McClelland has taken an active interest in N. E. L. A. activities, and in 1916 he was elected chairman of the Hydroelectric Section, continuing through this year. Mr. McClelland has the added distinction of being a fellow in the Royal Geographical Society of London.

Guy W. Talbot, who was elected president of the Northwest Electric Light & Power Association at its tenth annual convention, recently held at Spokane, Wash., is president of the Pacific Power & Light Company, Portland, Ore. Mr. Talbot was born in Centerville, Mich., on Aug. 12, 1873, and was educated in the public schools of Des Moines, Iowa, and the College of Emporia. He entered railroad work in Des Moines in 1891, following that occupation until March, 1910. During that time he was successively traveling freight and passenger agent for the Des Moines, Northern & Western Railway, traveling freight agent for the Iowa Central Railway, general traveling freight agent for the same road, traffic manager for the Peoria & Pekin Terminal Railway, from which position he was promoted to be general manager and later to be vice-president, serving in the later capacity from 1900 to 1905; vice-president and general manager of the Astoria & Columbia River Railway Company and Corvallis & Eastern Railway Company in 1905, and from 1906 to 1910 vice-president and general manager of the Oregon Electric Railway Company. Since 1910 he has been president and director of the Pacific Power & Light Company, the Portland Gas & Coke Company and the Walla Walla Valley Railway Company, all with headquarters at Portland.

Obituary

George Vasmer Leverett, consulting counsel of the American Telephone & Telegraph Company, died at Boston, Mass., Oct. 18. He was born at Charlestown, Mass., about seventy-two years ago, was educated at Harvard University, and became associated with the Bell system in 1886. For some time he was general counsel of the company.

Guy E. Mitchell, general manager of the Westfield (Mass.) municipal gas and electric lighting department, died in Westfield Oct. 18. He was a native of Lowell, Mass., and was a mechanical engineering graduate of the Massachusetts Institute of Technology, class of 1891. His professional career included consulting work in New York City and electric railway development in association with the late R. D. Gillett of Westfield in the Berkshire district, and he was for a time general manager of the Alden Sampson Company, Pittsfield, Mass.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

ELECTRICAL EXPORTS FOR JULY SMALL IN VOLUME

Figures for the First Seven Months of the Current Year Reach a Total of $32,682,738—New Listings Made Covering a Number of Products

During the month of July last exports of electrical goods amounted to $3,827,345, as compared with $2,995,857 for July of 1916. This figure, however, is somewhat less than that for some of the previous months in the current year. A considerable part of the falling off came in the larger apparatus of the power-house type and in motors, the export of which in July last was but little more in value than in July, 1916, when prices were lower.

Exports for the first seven months of the current year reached a total in value of $32,682,738, in comparison with approximately $20,000,000 for the first seven months of 1916. At this rate the exports for the year should reach almost $60,000,000. However, on account of the growing lack of bottoms for purely commercial use owing to government requirements, it now seems doubtful if the exports of electrical goods from the United States will be much more than $50,000,000. Even this figure will be a substantial increase over the figures for 1916.

The accompanying figures, which are furnished by the Bureau of Foreign and Domestic Commerce, show for July for the first time detailed figures for a number of products, namely, carbons; heating and cooking apparatus; magnetos, spark plugs, etc.; rheostats and controllers, and switches and accessories. It is largely for this reason that the value of miscellaneous electrical exports was not so great in July as in former months. The value of new items listed amounted in July to, roughly, $600,000. In comparing, therefore, with previous months this figure should be added to $1,323,150 for "all others" in order to arrive at the proper total.

	July		Seven Months Ended July	
Articles Exported	1916	1917	1916	1917
Batteries	$149,512	$290,312	$1,012,490	$2,394,714
Carbons	.....	102,828	.....	†102,828
Dynamos or generators	131,597	96,057	804,793	1,456,192
Fans	28,395	41,245	197,305	379,036
Heating and cooking apparatus	.....	23,295	.....	†23,295
Insulated wire and cables	370,378	357,953	2,091,846	4,327,928
Interior-wiring supplies, including fixtures	82,952	119,994	494,077	753,090
Arc lamps	803	1,962	10,292	11,736
Incandescent lamps:				
Carbon-filament lamps	3,738	23,349	60,282	113,306
Metal-filament lamps	165,132	198,630	872,527	1,629,628
Magnetos, spark plugs, etc.	.....	269,941	.....	†269,941
Meters and measuring instruments	46,486	68,630	449,268	626,320
Motors	411,474	411,687	2,736,786	3,699,864
Rheostats and controllers	.....	14,201	.....	†14,201
Switches and accessories	.....	177,052	.....	†177,052
Telegraph apparatus, including wireless	23,839	14,100	84,602	404,909
Telephones	74,162	180,937	1,023,626	1,269,936
Transformers	62,699	112,022	591,065	854,679
All other	1,444,690	1,323,150	9,505,929	14,174,083
Total	$2,995,857	$3,827,345	$19,934,888	$32,682,738

†Figures cover period beginning July 1.

PROGRESS TOWARD PLUG STANDARDIZATION SLOW

Development Temporarily Blocked by Inability of Manufacturers to Reach Agreement on Questions of Design, Patents, Etc.

On account of the war policy of the National Electric Light Association's executive committee it has not been feasible to carry on the usual activities of many of the committees of the organization, and in the wiring field particularly concerted efforts toward standardization progress have been lacking. The manufacturers have been intensely busy on government and closely allied work, and for this reason the normal amount of development work has been obliged to suffer. The condition is common to other branches of the electrical industry as well as to that particularly concerned with the manufacture of wire.

In view of the emphasis laid upon conservation of materials and labor, however, it is regarded as unfortunate in some circles that so little real progress has been made during the last few months in the direction of standardizing plugs at the appliance end of the cord. Industrial electric heating devices are in great demand, and it needs little argument to show the advantages which would result from plug standardization on the manufacturing side. At present development along this line appears to be at least temporarily blocked by the inability of all the more representative manufacturers of wiring fittings to reach an agreement on questions of design, patents, etc. On the insurance side conditions are also unsatisfactory, owing to the slowness of the underwriting interests to grasp the importance of adopting a more liberal policy toward improvements of demonstrated worth.

When it is realized that changes in the National Electrical Code proposed as far back as 1914 and brought up for consideration this fall, assuming favorable action in the latter case, cannot go into effect until the code is revised in 1918, the burden of delay upon the electrical industry is indicated. The holding back of improvements far beyond a reasonable time for their application on an extended scale, under proper supervision, on the ground that new developments are *ipso facto* unsafe until otherwise demonstrated, is a very discouraging feature of the present wiring situation.

THE CONTRACTOR-JOBBER PROBLEM ON PACIFIC COAST

Question of Preferential Discount Over Industrial Buyers Now Receiving Considerable Attention from Both Branches of the Trade

A phase of the jobber-contractor problem which has been receiving much attention on the Pacific slope is the old question of preferential discounts.

Taking first the contractors' point of view, their complaint is that jobbers have formed the habit of selling at wholesale discount to large industrial firms and other companies that do their own electrical construction on plant extension, temporarily employing for this purpose such journeymen as are required, and thereby obviating the need of employing a contractor.

The contractors do not object to wholesale discounts on material or supplies for use in maintenance, but when it comes to material for extensions where actual construction work is required, the contractor feels that the jobber is unfair in making it convenient for the owner to do the con-

struction on the day-labor basis. Where the jobber must sell materials for work of this sort direct to owners, the contractor feels he is entitled to protective discounts. This would at least enable the contractor to figure on the work on an even competitive basis instead of under conditions operating to his disadvantage.

Contractors who have made the most strenuous complaints along this line have pointed out that in time to come, when it becomes a question of the elimination of one or the other in the jobber-contractor competition, the contractor can be expected to develop and broaden into the jobbers' field, and even effectively to replace him. The contractor believes it is much more likely that the contractor of the future will take over the jobbers' field than that the jobbers should take on enough of the present contractors' work to eliminate the latter.

To consider the matter from the jobbers' point of view is to face the fact that the men who place the large orders—that is, the big corporations—are unwilling to deal with the small men in the field. In fact, the largest consumers are now even trying to buy from the manufacturer and in some instances have done so at a higher rate than they would have had to pay if they had obtained their supplies from other sources. This circumstance indicates how strong the feeling is that by direct dealing the profits of middlemen are kept low.

If the jobbers took off all of their salesmen, they point out that orders would still come in automatically from larger consumers. Further, if the jobbers were effectively prevented from direct sale to the consumers, this would simply mean that such trade would be diverted to those few large contractor-dealer firms that are able to carry the large stock required. Even in some of the larger Pacific Coast cities, for example, this would mean that such trade would be limited to three or four of the larger contractor-dealers.

The jobbers point out further that there is yet work for the contractors to do in perfecting their own organization before reaching out into this larger field. They cite, for example, the present not infrequent occurrence of a worker quitting his contractor-employer to take on a contract on which he bid in direct competition with the firm by which he was previously employed. Finishing this contract, he returns and is accepted as an employee in good standing by the same firm which had previously employed him.

METAL MARKET SITUATION

Little Activity, with Growing Uneasiness in Copper on Part of Buyers and Dealers

The week showed almost no changes in the metal situation. Lead, under a quiet market, slumped down to 6½ cents and spelter became somewhat weaker. In copper the general situation is about the same except for a growing uneasiness on the part of consumers and dealers. Production reached such low levels during the summer months that it is felt that a shortage may ensue, and this feeling adds to the anxiety that has prevailed owing to the abnormal condition of the market.

NEW YORK METAL MARKET PRICES

	Oct. 16	Oct. 22
Copper:	£ s d	£ s d
London, standard spot	110 0 0	110 0 0
Prime Lake	Govt. price 23.50	Govt. price 23.50
Electrolytic	Govt. price 23.50	Govt. price 23.50
Casting	Govt. price 23.50	Govt. price 23.50
Wire base	30.00 to 32.00*	30.00 to 32.00*
Lead, trust price	7.00	6.50
Nickel, ingot	50.00	50.00
Sheet zinc, f.o.b. smelter	19.00	19.00
Spelter, spot	8.17½ to 8.30	8.05 to 8.17½
Tin, Straits	61.12½	61.50
Aluminum, 98 to 99 per cent.	35.00 to 37.00*	35.00 to 37.00*

OLD METALS

Heavy copper and wire	23.00 to 23.50	22.00 to 23.00
Brass, heavy	14.50 to 16.50	14.00 to 16.00
Brass, light	11.00 to 11.50	11.00 to 11.25
Lead, heavy	6.00 to 6.25	5.25 to 5.50
Zinc, old scrap	5.50 to 6.00	5.50 to 5.75

*Nominal.

THE WEEK IN TRADE

EXCEPT for the growing scarcity of incandescent lamps, there is a steady tone to the market. Prices are very steady except for glass products, which are advancing because of the fundamental conditions with the glass producers. Incandescent lamps are slated to advance, for the first time, on new contracts around the first of the year.

Collections seem to be holding up remarkably well, notwithstanding the new Liberty Loan, although credits are in a somewhat uncertain position.

Certain railroad embargoes have deterred shipments in some directions and with winter approaching this action can be expected more frequently. A severe winter might prove very embarrassing to the industry.

NEW YORK

For the first time in many months the building market has taken on a hopeful aspect. According to the Dow Service Daily Building Reports, big building financiers are now publicly stating their belief that the turn for the better has come.

There is no change in the electrical market, deliveries, demand and prices remaining the same. Wire and lamps are now very difficult to obtain. In the case of lamps it is understood on good authority that for the first time incandescent lamps will advance in price. This advance is set for the first of the year. For a long time this move has been under consideration, but always some economy in production or distribution has developed and postponed such action. Profits have not been so great as before the war, and in the case of some of the smaller manufacturers it is well known that a continuance of present prices would prove financially disastrous. Lamps have been the last of the principal electrical goods to advance in price.

Credits are receiving more and more attention, although collections have not yet begun to fall off seriously.

COLLECTIONS AND CREDITS.—With the current condition of pressure for goods in almost, if not quite, every line and backward deliveries, collections are reported in a very satisfactory state. The acceptance of orders is based very much on the reputation of the buyer's promptness in paying his bills. This discretionary power is being exercised firmly. Credits follow suit in being very firm.

WIRING DEVICES.—The demand in the domestic market is not so active and is "sliding off," as one of the largest distributers phrased it. For export, however, heavy sales are anticipated. Prices are at a peak and no increase is looked for, as the buying would not be stimulated were quotations lowered, the general situation being too uncertain. It is a day-to-day proposition so far as buying is concerned, and no one can tell what may happen to change the relative position of the seller and buyer toward each other. The volume of business is as large as, if not larger than, ever; the difference is only in the character and location of the purchaser. The awarding of a contract by the government to the J. G. White Engineering Corporation of New York City for the construction of a naval and military base in France, to cost upward of $100,000,000, calls for a large quantity of wiring devices, and this opening evens up the general selling market. Briefly, the level of business in wiring devices is as high as ever, only the outlet is in a new and different direction.

VACUUM CLEANERS.—The scarcity of aluminum is still troubling manufacturers. The substitution of sheet steel, heavily coppered and nickeled, for aluminum has already been made in a few factories, and others freely admit the probability of following the same practice.

RANGES.—One manufacturer reports that a type in which sheet aluminum has been essential for linings has been temporarily discontinued, because the metal in suitable sizes cannot be obtained.

CONDUIT.—Pipe in some sizes is fully twelve months back in deliveries, with very little figuring on the future in shipments. Labor shortage and troubles incident to wage demands are reported as the primary cause of the delays. Conduit pipe for interior wiring is in fair supply at firm prices, and deliveries are not so restricted, two and three weeks being promised on accepted orders. The discount in this market is quoted at 45 per cent, as against a comparatively recent announcement of 40 per cent.

SOCKETS.—A scarcity prevails in some quarters. One jobber with a special socket has orders on his books for at least 225,000 pieces which he is unable to deliver. Elsewhere shipments are being made to satisfy urgent demands at no further advances. Difficulty in readily obtaining porcelain, and even the small amount of copper necessary in the brass for socket manufacture, is holding up the filling of orders.

LAMPS.—With jobbers the existence of an acute situation regarding lamps is freely admitted. In one instance 200,000 lamps of all sizes and for every use could be shipped on orders if obtainable. On miniature lamps a delay of six months in delivery is reported elsewhere, with regular sizes six to eight weeks behind. One lamp order amounting to $40,000, for delivery in thirty days, was promptly declined by a jobber, who declared his lamp business was so pressing that further orders were embarrassing. Small quantities are being shipped daily by jobbers, and were an order for 5000 lamps received for prompt shipment about 100 would be delivered. As it is, goods go out to customers on allotment. Rumors are abroad in the trade of an advance, ranging from 10 to 20 per cent, effective Jan. 1, 1918. This, however, it is understood, will not affect basis of present contracts.

WIRE.—Orders for wire are accepted and quotations are made by the manufacturer with the proviso that they are subject to obtaining copper from the producer. Manufacturers are not buying any more copper than the circumstances of imperative specifications call for. In some places wire is held to be "softer" in price, but no copper is to be had from the producers except at a premium over the official selling figure.

CHICAGO

Certain jobbers are beginning to realize that business is changing because of conditions brought about by the war. One of the chief changes is the fact that the central stations and contractor-dealers in certain territories are finding out more and more that they cannot order from hand to mouth, but must order in reasonable quantities if they expect to get delivery on their material. The tendency seems to be for the retailer to order more standard packages of merchandise, to cut down the number of items in his stock, but to buy a sufficient quantity of staple articles.

PRICES OF COPPER AND STEEL PRODUCTS.—Jobbers throughout the Central West know that manufacturers have bought stocks of materials for more than a year in advance and that price reductions cannot be expected immediately on products which contain copper and steel. The sales organizations and the jobbers are busily explaining this to the dealers, some of whom fail to grasp the situation.

CONSTRUCTION IN NORTHWEST.—Construction reports from the Northwest territory are far from good for the rest of this year. The opinion prevails that 1918 prices will be considerably reduced and that construction work which has long been delayed owing to the high prices can then be satisfactorily carried out. Electrical jobbers in the Northwest territory have a different view of this situation, and doubt is expressed if much construction work will be done even in 1918.

TIME-PAYMENT CAMPAIGNS.—Reports from distribution centers outside of Chicago, such as Kansas City, Minneapolis, St. Paul and Duluth, indicate that the Liberty Bond campaign has not interfered with time-payment appliance campaigns.

CONSTRUCTION IN THE SOUTHWEST.—Reports from Kansas City indicate that jobbers are expecting steadily increasing construction work.

BOSTON

The volume of business continues well sustained in the supply field. Prices are steady, with the exception of a softening tendency in lamp cord, resulting from the quotation of copper at a 34-cent base. Jobbers are well stocked in anticipation of the approaching season of holiday business. An opportunity is noted to start holiday business earlier than ever this year in the field of electrical Christmas gifts to be mailed to members of the American expeditionary forces abroad. Such gifts must be mailed not later than Nov. 15 to reach soldiers in France by Christmas morning, and the opinion is advanced that the time is ripe to develop such sales in the light equipment department during the coming three weeks. Battery lamps in particular should move rapidly in response to this opportunity. Jobbers report that shipments by manufacturers are on the whole improving, although railroad congestion and resulting embargoes are causing much local difficulty in maintaining stocks. Large government orders are being handled, notably in lamps, sockets and switches for the destroyer plant now under construction at Squantum, Mass. Jobbers are feeling a shortage of skilled labor and are actively engaged in training substitute employees to improve their service to the trade. Little building construction outside industrial work is now under way. Collections are somewhat better than within the last few weeks.

APPLIANCES.—Business is growing brisker in household appliance branches, the domestic labor problem being difficult at present. Prices are firm. Washing machines are enjoying a genuine boom; irons are moving freely, and despite the moderate weather, it is very difficult to maintain stocks of electric radiators. Vacuum cleaners are unusually active, but efforts to sell sewing-machine motors do not appear to be meeting with a very satisfactory response.

LAMPS.—Government and industrial orders are heavy. A new purchase form of contract permitting the manufacturer to raise prices is to go into effect Nov. 1. Manufacturers are trying to prevent hoarding and are closely scrutinizing large orders. Deliveries are somewhat slow, and although vigorous efforts are under way to increase production facilities, there seems to be no escape from a shortage this fall.

ELECTRIC SIGNS.—This branch of the trade is facing much uncertainty, in view of the request of the fuel committee (Massachusetts) that the use of signs be temporarily discontinued. Central station authorities question the practical savings resulting from this policy, but are co-operating by refraining from canvassing actively for sign business. The quasi-public authorities hold that the "killing" of signs will stimulate private economy, but the opinion is expressed in the trade that the psychological effect of continued good illumination is worth retaining. Company and free signs for town development are being cut out widely.

INDUSTRIAL ELECTRIC TRUCKS.—Inquiries are very numerous and the outlook was never better in this field. Many sales are being made, and if manufacturers can better deliveries they will reap a harvest.

ELECTRIC COAL LOADERS.—One New England manufacturer reports that he is practically oversold all the time and the demand for this labor-saving machinery is constantly increasing.

MOTORS.—Ordinary industrial business shows a decrease, but the demand for motors for government and related duty is increasing. Prices remain steady, and no further increases are in sight. Stocks are low and immediate deliveries of particular sizes are a matter of chance.

FIBER CONDUIT.—The demand is larger this fall than at this time in other years. Central station orders are being postponed to spring, but industrial and government orders are most active. Six carloads of this material have been ordered for service in connection with the new destroyer plant at Squantum.

ASBESTOS.—Deliveries of about one week can now be had on plain unsanded asbestos board, compared with about four weeks on sanded board. The volume of business is increasing on asbestos insulation of all classes.

ATLANTA

There does not seem to be so much activity this week as there was last. While underlying conditions remain strong and the volume of business steady, a slight lull is noted in the line of general supplies. This may be due to a reaction from strong government pressure on cantonment work in this section for the last few months. Then, too, the large water-power companies in some cases have contracted for industrial power up to their capacity and have reached the point where they will have to spend large sums for extensions and new plants at present prices or stand still and take the chance of securing lower labor and material prices later on. Opinions expressed along this line seem to indicate that the volume of business in general is bound to decrease if the large power companies cease to add more load. There is no appreciable evidence at this time, however, that the temporary lull this week is the reflection of the public utility situation.

The services of a number of electrical helpers have been discontinued at some of the cantonments, and while the more skilled men have been retained the addition of helpers to the industrial field has tended to make the labor situation more easy this week, permitting the completion of urgent jobs and the starting of some new ones. Building continues steady and the number of permits issued for residences and apartments shows no decrease.

TRANSFORMERS.—Considerable improvement is noted in the delivery of standard ratings up to 37.5 kva. In one instance the promise of shipment was brought down from twenty-four to fourteen weeks. Some betterment is also noted in the deliveries of semi-standard ratings. Although the shipment on the above ratings is looking much better, no encouragement is offered on standard or semi-standard ratings, 100 kva. to 300 kva. inclusive, unless a military necessity is shown. These capacities are proving very popular with the government, especially for cantonments.

ELECTRIC RETAIL SALES.—Dealers report an increasing activity this week in almost all household appliances and specialties. There is quite a demand for toasters and grills. Vacuum cleaners and electric washing machines are not going so fast as might be expected. Flatirons are beginning to move briskly. Electric ranges are doing very well considering the section and the class of labor. This line is showing a substantial increase over last year.

CREDITS AND COLLECTIONS.—The Southeastern jobbers are having a very prosperous year, owing to the heavy demand for all classes of supplies from industrial sources, not to mention lucrative government business. As a general rule nice profits and quick turnovers have been made which have given the jobbers more ready cash. This condition has reacted on manufacturers' collections to the extent that they are carrying less paper, the jobbers having reduced outstanding notes appreciably during the last few months. In fact, the jobbers are in better shape in this connection at present than they have been in a long time. On the other hand, some of the larger central stations are asking three to four months, with the privilege of renewal on unpaid balances at expiration.

SEATTLE

The week from the 15th to the 22d shows a marked decrease in business along most lines, particularly in sales to the mills, industrial plants and shipbuilding concerns, as compared with several weeks past. The largest decrease comes from the shipbuilding plants, which until to-day have been closed by strikes. There is a noticeable shortage in high-tension insulators, conduit, large rubber-covered wire, marine fittings, motors and high-wattage lamps which is causing considerable inconvenience. These shortages are expected to increase on account of poor freight conditions, which are daily growing worse. Car shortages in Oregon are serious, and no hope for immediate relief is held out. The labor situation is deplorable throughout the State.

Holiday orders in large amounts are being placed for all energy-consuming devices, particularly washing machines, ranges, vacuum cleaners, etc. Local dealers intend specializing in the sale of Christmas gifts along these staple lines. The last orders for the holiday trade will be placed by Nov. 1. Public utility companies in both the Washington and Oregon field engaging in the "Lighten the labor of the home" campaign report excellent results, including a volume of inquiries and satisfactory sales. Local dealers are doing a remunerative business as a result of the campaign.

Pick-up sales, including fixtures, wiring devices and lamps to the American Lake cantonment, and to the Puget Sound Navy Yard at Bremerton, swelled the volume of the week's activities. The navy yard particularly bought quite heavily.

MOTORS.—Dealers are unable to supply the demand for motors ordered by the lumber mills. Buying from the mills is increasing slowly with a daily reopening of plants which have been tied up with strikes.

WIRE AND POLE-LINE MATERIAL.—The sale of transmission wire and pole-line material to the Pacific Power & Light Corporation, serving the Puget Sound district, was the first sale of this nature of any consequence made recently. The material will be used in extensions in northern Skagit County. The local utility company is making minor improvements and extensions.

TRANSFORMERS, INSULATORS, ETC.—The Board of Public Works has opened bids for the year's supply of distribution and instrument transformers, insulators, etc., involving the expenditure of approximately $100,000. The smaller contracts went to local firms, while the larger contract is held up for one week.

LAMPS.—The demand is increasing daily and a shortage is being experienced. Prices remain firm with shipments unsatisfactory.

FIXTURES.—Moving slowly, with ample stocks and prices the same.

PROJECTORS.—Floodlamps for guard purposes at mills, shipyards and industrial plants are in great demand. Stocks are ample and prices remain firm.

HEATING APPLIANCES.—The demand for heaters, toasters and percolators is increasing.

SAN FRANCISCO

The prolonged fair weather has permitted the successful harvesting of crops and the completion of construction and field operations generally. As a result of this collections are better than last month and business in general is good. There is a notable tendency on the part of the central stations to conserve financial resources, and to call in salesmen who work on the smaller and less profitable business. This is partly because as much business as can be easily handled can be secured now in industrial lines, and also because of the delayed deliveries and high cost of small transformers and materials used for small installations. This condition has affected electric range sales very materially. It is suggested that the range business has also been hurt by the objection made by central stations to preferential discounts and increase of prices because this has advertised the idea of excessive cost.

WIRE.—Stocks of wire are fair. Deliveries are slow, particularly on weatherproof.

WASHING MACHINES.—The demand for all labor-saving devices continues to be heavy, particularly for washing machines. Stocks are fair just now, but deliveries are slow on all motor-operated devices.

LAMPS.—The Pacific Coast lamp allotment is barely sufficient to supply the demand, and there is sale for all that can be secured. The demand is particularly heavy for type C in the 100-watt size.

CONTROLLERS, SWITCHES, ETC.—Controlling devices, safety switches and other items affected by the recently enacted California safety code continue to be in great demand. Stocks are low and deliveries very slow.

PROJECTORS.—The demand for projectors continues good, and stocks are fair.

TRANSFORMERS.—Deliveries are improving slightly on all sizes of transformers, and this is noted with satisfaction in several quarters, because of the other lines which the transformer shortage has interfered with. It is now hoped that the deliveries will catch up with the demand.

Current Prices of Electrical Supplies

NEW YORK AND CHICAGO QUOTATIONS

The prices quoted are those prevailing in standard packages or specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the source of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers.

The variation in prices may be due to the difference in grade of products made by different manufacturers, to local conditions, or to both.

ARMORED CONDUCTORS, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List, per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE PER 1000 FT.—NEW YORK

Single-Conductor

Less than coil	$61.00 to $71.00
Coil to 1000 ft	59.17 to 68.87

Twin-Conductor

Less than coil	$105.00 to $135.00
Coil to 1000 ft	70.00 to 130.95

DISCOUNT—CHICAGO

Single-Conductor

Less than coil	+10%
Coil to 1000 ft	—10%

Twin-Conductor

Less than coil	+10%
Coil to 1000 ft	—10%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+10%
1/5 to std. pkg	20%
Std. pkg.	34%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+20% to 12%
1/5 to std. pkg	List to 20%
Std. pkg.	30% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.31	.32
Barrel lots	.28	.29

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 30	.35	.35
50 to barrel	.31 to .3175	.32 to .3275
Barrel lots	.28 to .2875	.29 to .2975

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. Per Coil	List, Per 100 Ft.
5/16	250	$5.00
3/8	250	7.50
1/2	100	10.00
3/4	50	13.00
1	50	21.00
1 1/4	50	26.00
1 1/2	25–50	35.00
2	25–50	45.00
2 1/2	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less Than Coil	Coil to 1000 Ft.
3/8-in. single strip	$75.00	$69.75
3/8-in. double strip	75.00	72.00
1/2-in. single strip	100.00	93.00
1/2-in. double strip	100.00	96.00

NET PER 1000 FT.—CHICAGO

	Less Than Coil	Coil to 100 Ft.
3/8-in. single strip	$75.00	$63.75
3/8-in. double strip	78.75	71.25
1/2-in. single strip	100.00	85.00
1/2-in. double strip	105.00	85.00–95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List Per Foot	Size, In.	List Per Foot
7/32	$0.05 1/2	1	$0.25
1/4	.06	1 1/4	.33
3/8	.09	1 1/2	.40
1/2	.12	1 3/4	.47
5/8	.15	2	.55
3/4	.18	2 1/4	.65

NET PER 1000 FT.—NEW YORK

	Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—	$55.00	$24.50	$21.50
1/4-in.—	60.00	27.00	23.50

NET PER 1000 FT.—Chicago

	Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—	$36.67-$55.00	$27.50	$23.10-$24.75
1/4-in.—	$40.00-$60.00	$30.00	$25.20-$27.00

CONDUIT, COUPLINGS AND ELBOWS. RIGID IRON

Card No. 38

Size, In.	Conduit, List per Foot	Couplings, List	Elbows, List
1/4	$0.08 1/2	$0.05	$0.19
3/8	.08 1/2	.06	.19
1/2	.08 1/2	.07	.19
3/4	.11 1/2	.10	.25
1	.17	.13	.37
1 1/4	.23	17	.45
1 1/2	.27 1/2	.21	.60
2	.37	.28	1.10
2 1/2	.58 1/2	.40	1.80
3	.76 1/2	.60	4.80

DISCOUNT—NEW YORK

	1/4 in. to 1/2 in.	3/4 in. to 3 in.
Less than 2500 lb.	6%	8%
2500 to 5000 lb.	9%	11%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	1/4 in. to 1/2 in.	3/4 in. to 3 in.
Less than 2500 lb.	3.8%	5.8%
2500-5000 lb.	6.8%	8.8%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$5.00
Discount	30%

CHICAGO

List	$5.00 to $6.00
Discount	25%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	28%
1/5 to std. pkg	38%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	28%
1/5 to std. pkg	38%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK.

	Per 100 Net
Less than 1/5 std. pkg.	$5.75
1/5 to std. pkg.	4.50

Standard package, 500. List, each, $0.07.

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$6.25
1/5 to std. pkg.	5.25

Standard package, 500. List, each, $0.07.

LAMPS, MAZDA

105 *to* 125 *Volts*

	Std. Pkg.	List, Each
Regular, clear:		
10 to 40-watt—B	100	$0.27
60-watt—B	100	.36
100-watt—B	24	.65
75-watt—C	50	.65
100-watt—C	24	1.00
200-watt—C	24	2.00
300-watt—C	24	3.00
Round bulbs, 3⅛ in., frosted:		
15-watt—G 25	50	.50
25-watt—G 25	50	.50
40-watt—G 25	50	.50
Round bulbs, 3¾ in., frosted:		
60-watt—G 30	24	.72
Round bulbs, 4⅝ in., frosted:		
100-watt—G 35	24	1.05

DISCOUNT—NEW YORK

Less than std. pkg.	Net
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	Net
Std. pkg.	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
less than coil (250 ft.)	$33.98
Coil to 1000 ft.	25.82

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$36.56 to $36.88
Coil to 1000 ft.	27.42 to 27.66

LAMP GUARDS, WIRE

Standard packages from 50 to 150.

NEW YORK

Net per 100	$20.00 to $29.00

CHICAGO

Net per 100	$14.58 to $38.35

OUTLET BOXES

Nos.	List, per 100
101—A, A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200 S.E., 300, AX, 1½, 4 S	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S. 1½, 3 R.	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	25%	20%
$10.00 to $50.00 list	42%	37%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	40%	35%
$10.00 to $50.00 list	50%	45%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

PORCELAIN CLEATS—UNGLAZED

2 and 3 Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$38.00
1/5 to std. pkg.	$19.00

Standard package, 2200 List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$15.80 to $20.54
1/5 to std. pkg.	13.00 to 19.24

Standard package, 2200 List per 1000, $20.

PORCELAIN KNOBS

NEW YORK

Per 1000 Net	Std. Pkg. 3500	Std. Pkg. 4000
	5½ N.C.—Solid Nail-it—N.C.	
Less than 1/5 std. pkg.	$29.00	$30.75
1/5 to std. pkg.	15.60	24.20

CHICAGO

Per 1000 Net	Std. Pkg. 3500	Std. Pkg. 4000
	5½ N.C.—Solid Nail-it—N.C.	
Less than 1/5 std. pkg.	$11.85 to $18.00	$20.75 to $30.75
1/5 to std. pkg.	9.00 to 11.10	16.30 to 24.20

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
⅛-in. cap key and push sockets	500	$0.33
⅛-in. cap keyless socket	500	.30
⅛-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	Net
1/5 to std. pkg.	20%

DISCOUNT—CHICAGO

Less than 1/5 std pkg.	Net
1/5 to std. pkg.	15%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. R. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S P. S. T.	0.42
60-amp. S. P. S. T.	0.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	0.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

Less than $10 list	+5% to 5%
$10 to $25 list	11% to 16%
$25 to $50 list	14% to 24%

DISCOUNT—CHICAGO

Less than $10 list	+5% to 5%
$10 to $25 list	11% to 16%
$25 to $50 list	14% to 24%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

SWITCHES, SNAP AND FLUSH—Cont'd

10-Amp. 250-Volt Push-Button Switches

	Std. Pkg	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	Net
1/5 to std. pkg.	15%
Std. pkg.	28%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+20% to net
1/5 to std. pkg.	Net to 15%
Std. pkg.	30%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List, Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	List	..
$2.00 to $10.00 list	20%	..
$10.00 to $50.00 list	30%	..

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $2.00 list	25% to 50%	15% to 40%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00
Discount	30%

CHICAGO

List price	$4.50 to $5.00
Discount	25% to 30%

WIRE, ANNUNCIATOR

NET PRICE—NEW YORK

No. 18, less than full spools	$0.49
No. 18, full spools	0.45

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.6585
No. 18, full spools	0.55 to 0.5585

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
11	$18.00	$14.00	$11.25
12	27.09	23.22	19.35
10	37.80	32.40	27.00
8	53.34	45.72	38.10
6	84.42	72.36	60.30

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$18.00	$16.00	$14.00
12	27.79-28.63	23.82-24.54	19.85-22 50
10	34.44-38.78	30.47-31.57	27.70-28.70
8	48.84	43.13-44.77	39.20-40.70
6	68.25-70.80	62.05-64.00	55.85-57.60

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 8 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb.	$37.25
25 to 50 lb.	36.25
50 to 100 lb.	35.25

CHICAGO

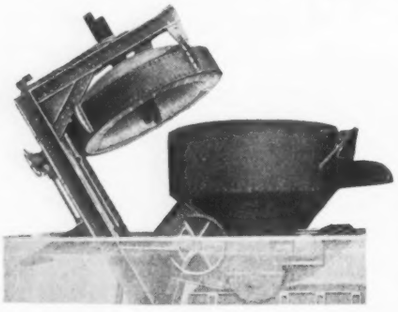
	Per 100 Lb. Net
Less than 25 lb.	$40.35to $42.00
25 to 50 lb.	39.35 to 41.00
50 to 100 lb.	28.35 to 40.00

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Single and Three-Phase Electric Furnaces

The Snyder electric furnace was developed particularly for converting steel scrap into high-grade castings in an efficient, rapid and simple manner. These furnaces are now built in either single-phase or three-phase types. In the single-phase furnace only one electrode is used, and in the three-phase furnace two relatively small electrodes are used with the third connection through the bottom contact to the bath.



THE TILTING ROOF IS A FEATURE OF THIS FURNACE

These furnaces are particularly characterized, it is said, by the use of higher voltages with consequently smaller currents, longer arcs and the Snyder system of reactance control. The smaller currents resulting from the higher voltages decrease the necessary size of electrodes, make the matter of handling electrodes simpler, decrease the heat loss due to electrode heat conductivity, and make possible the tilting roof feature by which the furnace can be charged through the top and the necessity of side doors is obviated.

Another important feature of the high-voltage, long-arc furnace with reactance control, it is pointed out, is the diminished surge effect upon power lines, due to the fact that small changes in the arc length have very little effect in percentage.

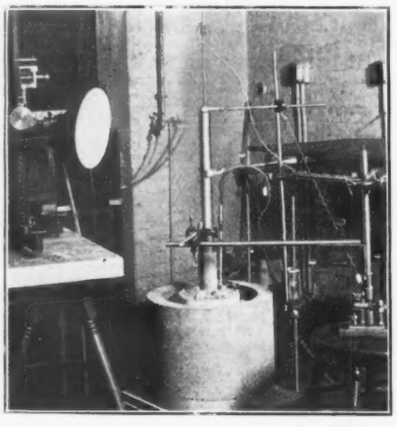
The tilting-roof feature not only enables the furnace to be recharged in from one to five minutes but saves in the cost of labor and roofs, and with the accompanying doorless feature results in the rapid deoxidization of the metal. This exclusion of oxygen during melting effects a further important saving in the electrodes. On account of the compactness of the furnace and the smallness of heat losses the kilowatt input during the refining period following the melting is cut down to a minimum.

These furnaces are built in three types, those under 1 ton (0.9-t.) capacity being mounted on trunnions and tipped forward for pouring by handwheels. A furnace of 1-ton capacity is built in what is known as the heave type, which is especially adapted for heavy shank ladling, the position of the spout remaining fixed while the furnace is tilted about a given point. Furnaces of more than 1-ton capacity are mounted on rockers for pouring.

These furnaces are made by the Industrial Electric Furnace Company of Chicago.

Tin Pyrometer

A tin pyrometer for measuring temperatures above the thermocouple range with the use of a direct insertion pyrometer has been developed by the Pyrolectric Instrument Company of Trenton, N. J. The tin is contained in a graphite bulb and expands through a graphite capillary tube. In this way the metal is subject to a reducing atmosphere, which tends to maintain a bright surface and keep the metal pure and free from dross. The expansion of the graphite is almost negligible in comparison with that of the tin. The tin does not appreciably evaporate until a temperature of presumably 2000 deg. C. is reached so that no difficulty in change of calibration is encountered.



FOR MEASURING HIGH TEMPERATURES

A steel tube containing an insulated contact is lowered down to the capillary tube until it makes a contact with the surface of the tin and thus completes a circuit through an electric buzzer or sounder. The height of the tin is indicated by the position of the upper end of the steel tube which holds a pointer that moves beside a scale. Since the contact is insulated in quartz, which has an inappreciable thermal expansion, the inaccuracy is negligible.

Induction-Motor Control Panels

Where it is desired to combine in one unit the complete control equipment for wound-rotor induction motors, a neat, safe and convenient means either for starting or for speed variation is provided by type RF control panels, manufactured by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. By their use motors are provided with complete protection from injury due to overloads, failure of voltage and improper starting, it is claimed. Panels are suited to all applications where drum controllers may be employed. Each outfit consists of a pipe-mounting slate panel on which are mounted an oil circuit breaker for the primary circuit, a drum controller for the secondary circuit, and when desired one or more meters mounted on the panel. The resistors that are used with these panels are separately mounted.

One of the most interesting features of these panels is an interlock between the oil circuit breaker and the drum controller which renders it impossible for the operator to start the motor without all the resistance in the secondary.

Electric Heater

An electric heater, the top, base and legs of which are made of cast iron, highly nickel-plated, is being offered to the trade by the Allmur Manufacturing Company of Marion, Ind. The drum or body of the heater is of polished sheet steel. The heater is equipped with a patented removable unit which is rated at 600 watts. It is furnished complete with 10 ft. (3.05 m.) of asbestos heater cord and separable attachment plug. This stove stands 14 in. (35.8 cm.) high, diameter of base is 10 in. (25.4 cm.), diameter of the top 9 in. (22.8 cm.), and diameter of the drum, 8 in. (20.0 cm.).

EQUIPPED WITH A REMOVABLE UNIT

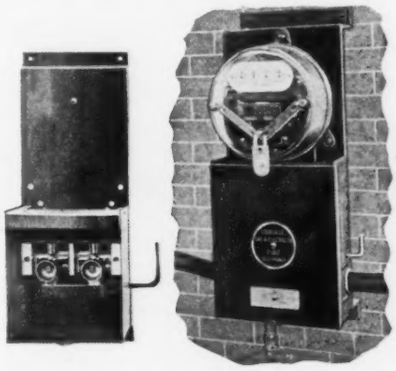
Water Purifier

An electric water purifier that sterilizes water by electrolysis has been developed by the American Utilities Company of St. Joseph, Mich. This device operates on 110-volt alternating-current and direct-current circuits. It has a capacity of purifying 5 gal. (15 l.) of water at one time. The device is equipped with 6 ft. (1.8 m.) of insulated cord and a two-piece attachment plug. With each purifier is furnished a special 2-gal. (7.5-l.) sanitary glass container in which to purify the water, equipped with a non-corrosive faucet for drawing off the purified water above the sediment.

Protective Service and Meter Equipment

The Metropolitan Engineering Company, 35 Vestry Street, New York City, has developed the protective service and meter equipment shown in the accompanying illustration. The manufacturers point out that the benefits resulting from the use of these equipments include tamper-proof and fool-proof features, safeguarding of revenue, continuity of service, prevention of unauthorized interference, safety to life, elimination of fire hazard, uniformity of service equipment, accessibility for tests and repairs, and economy of installation expenses.

This protective device was designed to accommodate all of the modern single-phase watt-hour meters, both two-wire and three-wire, 110 volts and 220 volts, in capacities up to 30 amp. The device is made of wrought steel and designed so that the service switch and service fuses are inclosed with the meter terminals in a sealable service cabinet. The switch is externally operated, permitting of opening or closing the circuit, but offering positive protection against tampering at all times. The service cabinet, all joints



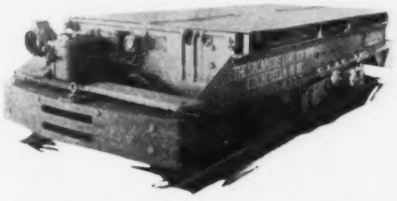
INTERIOR AND EXTERIOR VIEW OF SERVICE BOX

of which are electrically welded, is combined with a metallic mounting board having room at the top for mounting the watt-hour meter. Ample space is provided in the service cabinet for wiring, and several knock-outs are provided for conduit on either side and bottom of the cabinet to accommodate the incoming and outgoing service and house wires.

Storage-Battery Locomotive

Single-motor drive, which reduces the number of working parts and bearings and at the same time gives a quicker starting torque with simple and efficient control, is one of the advantages claimed for the storage-battery locomotive shown herewith. Specially designed bearings in "radial housings" are used, which give extreme flexibility, insuring the best operation on bad tracks, as with this feature each wheel is in close contact at all times with the rails and consequently gives greater hauling power to the locomotive. A chain drive is used between jack-shaft and axles from which have been eliminated the bad features of the ordinary chain drive. It is provided with special means for easy adjustment, thus enabling a constant tension on the chain to be maintained at all times. All bearings on axles and jack-shafts are self-aligning ball or roller type, thereby giving the greatest efficiency between the motor and rails.

Charging equipment of heavy-duty



LOCOMOTIVE FOR MINE SERVICE

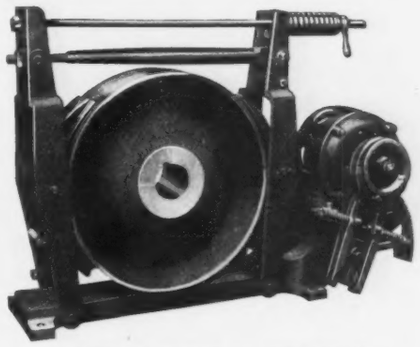
type with automatic features adapted for mine service makes the charging of the storage battery simple and reliable, and does away with the possibility of abusing the battery through excessive use or overcharging, it is said.

This locomotive is made by the Ironton Engine Company of Ironton, Ohio.

Motor-Operated Brakes

Types RS and M are the terms designating an alternating-current, motor-operated brake and a direct-current, magnet-operated brake respectively, recently developed by the Cutler-Hammer Manufacturing Company of Milwaukee, Wis. The alternating-current brake with motor operation has been generally found to be more suitable than one depending on solenoid or magnet operation because of the inherent characteristics of alternating-current solenoids being unsuitable for braking service. The motor-operated brake is silent in releasing, in applying and while held released. A high-torque squirrel-cage motor is employed, geared to a toothed sector, which is linked to the arms carrying the brake-shoes. When power is applied the motor revolves until the brake is released. It then stalls and maintains the brake in the released position until power is cut off. These brakes are made in sizes ranging from 8 in. to 30 in. (20.3 cm. to 76 cm.), with ratings as high as 250 hp.

The direct-current magnet or solenoid brake is similarly constructed, but has a magnet in place of a motor, the direct-current magnet being suited for



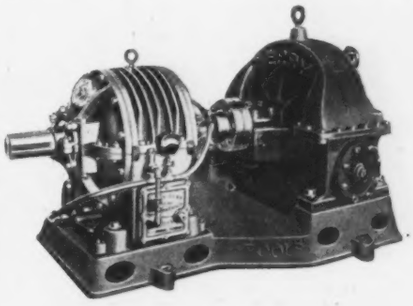
BRAKE IS SILENT IN RELEASING

brake operation. Six standard sizes range from 8 in. to 27 in. (20.3 cm. to 68.6 cm.), with horsepower ratings like the motor-operated type RS brake mentioned. Brakes of this construction are particularly suited for severe service, it is said.

Turbo - Gear for Mill Installations

In many mill installations, especially for line-shaft drives, it is very desirable to have the driving and driven shafts in the same straight line. This construction results in a great saving in floor space as well as permitting a more convenient and better grouping of the units. An interesting application of this character is shown in the accompanying illustration, which shows two 100-hp. turbo-gears direct-connected to motor-driven line shafts, the speed reduction in each case being 730 to 122 r.p.m.

It is pointed out that the gears and motors are mounted on base plates set upon concrete pillars. This brings the gear shaft and line shaft directly in alignment. As the turbo-gear requires



METHOD OF APPLYING GEAR

no subsequent attention or adjustment after being properly installed, it is feasible to mount the gear in the most convenient position. The turbo-gear is manufactured by the Poole Engineering & Machine Company, Woodberry, Baltimore, Md.

Trade Notes

EDWARD C. SOMMER, secretary and treasurer of the Sommer Lighting Fixture Company of New York City, died Sept. 7.

THE GARFIELD MANUFACTURING COMPANY, Garfield, N. J., is the new name of what was formerly the Hemming Manufacturing Company.

THE STANDARD STAMPING COMPANY, Huntington, W. Va., is now occupying its new "daylight" factory. The company was formerly at Marysville, Ohio.

THE WARD LEONARD ELECTRIC COMPANY, Mount Vernon, N. Y., is now represented in Detroit, Mich., by the Electrical Specialties Company, 69 State Street.

W. H. BRAMMAN, formerly with the American Carbon & Battery Company, has become associated with the Walter A. Zelnicker Supply Company, St. Louis, Mo., as assistant to the president.

A. H. BANNISTER has been appointed sales manager of the Western Electric Company at Minneapolis, Minn., effective Oct. 9. He formerly occupied the same position with the company at Omaha, Neb., this place being taken by M. A. Buehler.

THE DOMESTIC ENGINEERING COMPANY, Dayton, Ohio, has worked out a new plan of Delco apprenticeship, which is now in operation. It is approved as much better and more efficient than the former system, giving the apprentices broader and more thorough training.

THE LINDSTROM, SMITH COMPANY, Chicago, has opened an office and warehouse in New York City. S. T. Honey, formerly with the Central Electrical Supplies Company, is in charge. All orders originating in Eastern territory have been placed with the new branch since Oct. 1.

THE AMERICAN APPLIANCE COMPANY, New York City, has purchased the controlling interests of the Metalyte Company, Inc. To commemorate this event the Appliance Company gave a dinner at the Hotel McAlpin on the evening of Oct. 4. About thirty guests were present, including leading lamp manufacturers and the managers and sales force of both companies.

THE CONDENSITE COMPANY OF AMERICA, Bloomfield, N. J., in order to facilitate work being done for the government, has formulated conditions under which shipments of its products will be given preference by transportation companies. They are accompanied by the assurance of the Council of National Defense to the same effect.

THE PAGE STEEL & WIRE COMPANY, Monessen, Pa., and Adrian, Mich., is now the corporate name of what was formerly the Page Woven Wire Fence Company. It has opened a branch office at 644 Union Arcade, Pittsburgh, Pa., of which E. C. Sattley will be general manager. Correspondence for the various departments, however, should be addressed as heretofore.

BURWELL S. CUTLER, Buffalo, N. Y., was confirmed as chief of the Bureau of Foreign and Domestic Commerce, Department of Commerce, by the Senate prior to adjournment. Mr. Cutler, who is well known in manufacturing circles in western New York, came into the bureau six months ago to assist in putting the organization on a thoroughly business basis. He was made first assistant chief, but since the resignation of Dr. E. E. Pratt has been acting chief.

THE INDIANA RUBBER & INSULATED WIRE COMPANY, Jonesboro, Ind., has presented all employees who have been in its service for one year or more with a life insurance policy written by the Metropolitan Life Insurance Company, New York. The amount of the policy is in accordance with the number of years of service and will be increased yearly as each employee grows older in the service. The total amount of protection will amount to approximately $250,000, the expense of which will be paid by the Indiana company.

THE ROBBINS & MYERS COMPANY'S employees on Sept. 22 received their first bonus payments. The total amount of money represented in the distributed checks runs well up into the thousands. Out of approximately 2251 factory employees of the Springfield (Ohio) plant, 1302 received bonus checks, while 464 were handed checks for 3 per cent bonuses for perfect attendance. Any of the last named who continue their perfect records will draw 4 per cent the second month and then 5 per cent attendance bonuses will be paid monthly. The next service checks will come along Dec. 25, for the quarter immediately preceding.

THE NORTHWESTERN ELECTRIC EQUIPMENT COMPANY, St. Paul, Minn., will open for business a new division sales office and warehouse at Duluth, Minn., on Nov. 1. The building has ample dock and railroad facilities. A. M. Baldwin, Jr., will assume charge as district sales manager.

Trade Publications

ROPE TRAMWAY SYSTEM.—Book No. 343, descriptive of "Rope Tramway Systems," has been published by the Link-Belt Company of Chicago.

CARTRIDGE FUSES.—Daum refillable cartridge fuses for electric light and power are described in a bulletin prepared by A. F. Daum of Pittsburgh, Pa.

INSULATING BRICK.—Nonpareil insulating brick for boiler settings is described in a leaflet prepared by the Armstrong Cork & Insulation Company of Pittsburgh, Pa.

PORTABLE RADIATOR.—The Simplex Electric Heating Company of Cambridge, Mass., has issued a leaflet descriptive of its electric portable radiator for lamp socket use.

GAS ENGINES.—The Bruce-MacBeth Engine Company, 2111 Center Street, N. W., Cleveland, Ohio, has prepared bulletin No. 156, descriptive of its multiple-cylinder gas engine.

EXPANDED METALS.—The Consolidated Expanded Metal Companies of Braddock, Pa., is distributing a report from the Underwriters' Laboratories, Inc., on its "Steelcrete" mesh for guards.

PUMPS.—The Worthington Pump & Machinery Corporation, 115 Broadway, New York City, has prepared bulletin No. W-308, descriptive of its Worthington duplex piston pattern pumps for general service.

WIND POWER.—The Economy Power Appliance Company of Tomah, Wis., has prepared a booklet descriptive of its wind power machine for light, power and heat for the home, farm, factory and municipality.

LIGHTING FIXTURES.—The "four-in-one light" is illustrated and described in a book prepared by L. Plant & Company, 432 434 East Twenty-third Street, New York City. These fixtures are said to be dust-proof and bug-proof.

SAND AND GRAVEL WASHERY.—The Link-Belt Company of Chicago is distributing folder No. 340, descriptive of its Link-Belt sand and gravel washery installation at the plant of the Raritan Ridge Clay Company, Metuchen, N. J.

STOVES.—The Standard Electric Stove Company of Toledo, Ohio, is distributing a folder descriptive of its electric stoves. This folder describes an electrotype plate which this company is furnishing for central station companies to use on light bills.

COLORED LACQUERS.—The Moller & Schumann Company, Marcy and Flushing Avenues, Brooklyn, N. Y., has prepared bulletin No. 2, descriptive of its colored lacquers, air-drying and baking types. These lacquers are for use on manufactures of tin, polish, nickel, aluminum, zinc, etc.

STORAGE BATTERIES.—The Chloride accumulator and the Tudor accumulator and parts and accessories are illustrated and described in a bulletin prepared by the Electric Storage Battery Company of Philadelphia, Pa. This company has also prepared a price list section that is issued in connection with the catalog.

GALVANOMETERS—The Pyrolectric Instrument Company of Trenton, N. J., has prepared circular No. 7, descriptive of its Northrup alternating-current galvanometer. This bulletin also describes the Brooks variable self and mutual inductor, Bureau of Standards type. This company has also prepared circular No. 6, descriptive of its Compton quadrant electrometers for measurements of very small currents or electrostatic potentials.

MEASUREMENT OF HIGHER TEMPERATURE.—"Production and Measurements of the Higher Temperatures" is the title of a bulletin now being distributed by the Pyroelectric Instrument Company, 148 East State Street, Trenton, N. J. This booklet also furnishes information and general comments on temperatures and a description of the Northrup-Ajax high-frequency induction furnace, the Northrup tin pyrometer, the Northrup pyrovoleter, alternating-current galvanometer, Bureau of Standards type of variable self and mutual inductor and the Compton quadrant electrometer. All of this apparatus is made by the Pyroelectric Instrument Company.

New Incorporations

THE LIMA (OHIO) STORAGE BATTERY COMPANY has been incorporated with a capital stock of $5,000 by H. W. L. Kidder, F. I. Bayley and E. R. Fletcher.

H. F. BARDWELL has been appointed New York district manager for the Vanadium-Alloys Steel Company of Pittsburgh and Latrobe, Pa., with offices at 30 Church Street, New York City.

THE COSMOPOLITAN GAS & ELECTRIC SUPPLY COMPANY of New York, N. Y., has been incorporated with a capital stock of $10,000 by D. and S. Swartz and W. Schlessinger, 280 Bowery, New York, N. Y.

THE HERCULES STORAGE BATTERY COMPANY of West New York, N. J., has been chartered with a capital stock of $20,000 to manufacture storage batteries. The incorporators are: Alfred J. Ellis, Robert G. Wiencke and M. Wiencke.

THE KANSAS CITY LIGHT COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $750,000. The incorporators are: C. L. Rimlinger, F. A. Armstrong and C. M. Egner of Wilmington, Del.

THE GENERAL APPLIANCE COMPANY OF AMERICA, of Jersey City, has been incorporated by William Fitzgerald, Maxmilian Weil and Henry Solbel. The company is capitalized at $50,000 and proposes to manufacture and deal in telephone accessories.

THE PORTLAND (TENN.) ELECTRIC COMPANY has been incorporated with a capital stock of $10,000 to construct and operate an electric plant in Portland. The incorporators are: R. D. Moore, W. C. Skaggs, George W. Moore, W. C. Austin and George G. Moore.

E. ROTHSCHILD, INC., of New York, N. Y., has filed articles of incorporation with a capital stock of $10,000 to manufacture private control and watchman's electric clocks. The incorporators are: A. L. Stock, E. and H. J. Rothschild, 277 West Fourth Street, New York, N. Y.

THE CUMANA LIGHT & POWER COMPANY of Cumana, Venezuela, has been chartered with a capital stock of $50,000 by Arthur W. Britton, Joseph F. Curtin and Samuel B. Howard of New York, N. Y. The company proposes to acquire and operate light and water plants in the city of Cumana.

THE HYGRADE MACHINERY & EQUIPMENT COMPANY of Newark, N. J., has been chartered with a capital stock of $100,000 to manufacture electrical equipment and appliances. The incorporators are: Frederick A. Holt, Thomas J. Graves and Harry A. Amerta, 22 North Eleventh Street, Newark, N. J.

THE VERO (FLA.) UTILITIES COMPANY has been incorporated with a capital stock of $20.000 for the purpose of owning and operating power, ice and cold-storage plants, docks, autos and all public utilities. The officers are: C. G. Redstone, president; O. Roach, vice-president; Joseph Hill, secretary and treasurer.

THE AUTOMATIC TROLLEY LOCK COMPANY of the Bronx, New York, N. Y., has been chartered by H. D. Junge, 951 Grant Avenue; L. F. Roggenstein, 1060 Clay Avenue, and J. M. Ruhl, 2426 University Avenue, the Bronx. The company is capitalized at $100,000 and proposes to buy patent rights and manufacture equipments for railroads, trolley cars, autos, etc.

THE NICHOLAS SABO COMPANY of New York, N. Y., has been incorporated with a capital stock of $25,000 by N. Sabo, 407 Central Park West, New York, N. Y.; H. Wasserman, 32 Meserole Street, Brooklyn, N. Y., and L. W. Bowen, 46 Manhattan Street, New York, N. Y. The company proposes to manufacture lamp houses for use in connection with moving picture or stereopticon machines.

THE MOTOR STARTER CORPORATION has filed articles of incorporation with the Secretary of State with a capital stock of $2,000,000. This company was formed to take over the patents of Henry K. Stewart, one of the founders of the Stewart-Warner Speedometer Corporation, and it will also take over the Stewart plant at Long Island City. The company will manufacture not only self-starters but other electrical equipment for automobiles. Among the directors are: Samuel McRoberts, Charles V. Rich, Eric F. Swenson, S. Magnus Swenson and Frank A. Vanderlip.

New England States

DAMARISCOTTA, ME. — The Public Utilities Commission has authorized the Lincoln County Power Company, successor to the Portland Power & Development Company, to execute a mortgage amounting to $500,000 on its property and to issue $108,000 in bonds, $12,400 in preferred stock and $100,000 in common stock, to be used in payment of properties of the Twin Village Water Company of Damariscotta and the Lincoln County Power Company, which are to be consolidated under the name of the latter. Arrangements have also been made by the Lincoln company for the purchase of the property and franchises of the Boothbay Harbor (Me.) Electric Light & Power Company, which has a distribution system only, taking electricity from the Lincoln County Power Company. The company is also planning to build an electric generating station at Bristol Mills with transmission lines to its present plant at Damariscotta Mills and to a point connecting with the present system at Boothbay Harbor. The cost of the Bristol Mills development is estimated at $98,000, and the purchase price of the Boothbay Harbor distributing system is placed at $117,000. Additions and improvements are being made to its present plant at a cost of about $12,200.

GUILFORD, ME.—The Public Utilities Commission has granted the Piscataquis Woolen Company permission to sell its property, franchises, etc., in Guilford to the Penobscot Bay Electric Company for $8,000.

NORRIDGEWOCK, ME. — The Central Maine Power Company of Augusta, it is reported, has purchased the Bomazee Rips power at Norridgewock and also the flowage rights at the grist mill here. The old power house near the M. W. Savage property, from where the power for the electric railway between Norridgewock and Madison was once supplied, is again being equipped with machinery and will be added to the trunk line.

CLAREMONT, N. H.—Rapid progress is being made by the Claremont Power Company in the construction of its new substation at Claremont, which will increase its output by 2000 kw. The company has increased the size of its transmission lines to the substation of the Monadnock Mills and is planning for the installation of additional transformers to double the load.

BURLINGTON, VT. — The Municipal Electric Light Department has decided to close down the municipal electric generating plant and purchase energy from the Burlington Light & Power Company. The electric plant will be held.

BOSTON, MASS.—The Edison Electric Illuminating Company of Boston has applied to the Commission on Waterways and Public Lands for permission to lay cables in Neponset River between Commercial Point and Squantum in the cities of Boston and Quincy.

BOSTON, MASS.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 29, for construction of pitch and gravel roof over the boiler room, central power plant building 108, at navy yard, Boston, Mass. Specification (No. 2629) may be obtained upon application to the above bureau or to the commandant of navy yard named.

CAMBRIDGE, MASS.—The committees on wires and lamps has granted the Cambridge Electric Light Company permission to erect and maintain poles in Mount Vernon, Irving, Pilgrim and Second Streets, Putnam Avenue, Berkshire Street, Kendal Square, Huron Avenue, Trowbridge, Elm Street, Gorham Street, Hancock Street, Lechmere Square and Camelia Avenue. The company was also granted permission to install additional cables in conduits in several streets and avenues.

CHICOPEE, MASS.—The Electric Light Commission has recommended that street-lighting system be improved in the main street in Fairview by changing the 50-cp. lamps for 100-cp. lamps.

FALL RIVER, MASS.—The State Gas and Electric Light Commission has authorized the Fall River Electric Light Company to take by eminent domain the land in Fall River, Swansea, Somerset, Seekonk and Rehoboth for the erection of the proposed high-tension transmission system to the Rhode Island line. Locations for the extension have been granted by the town of Rehoboth, but the towns of Swansea, Somerset and Seekonk have withheld their action until the decision of the commission.

FLORENCE, MASS.—A two-story addition is being erected to the power house of the Northampton plant of the Nonotuck Silk Company in Florence.

MALDEN, MASS.—The Council has given its approval of a five-year street-lighting contract with the Malden Electric Company which provides for an entire revision of the street-lighting system throughout the city. Luminous arc lamps mounted on ornamental iron poles will be placed on Pleasant Street from Malden Square to Summer Street. Arc lamps of high candlepower will be erected in Maplewood, Linden, Suffolk and Oak Grove Squares and luminous arc lamps will replace all lamps now in use.

WEST SPRINGFIELD, MASS. — The Board of Selectmen has granted the Turners Falls (Mass.) Power Company a franchise to extend its transmission lines through the town. The Turners Falls company and the Agawam Electric Company now have the joint contract to extend their transmission lines through Sykes Avenue to Westfield.

HARTFORD, CONN.—The Hartford Electric Light Company is building an addition, 100 ft., to its power plant at Dutch Point. Two new boilers of 1250 hp. each are being installed and also a 10,000-kw. steam turbine, increasing the output of the plant to 36,000 kw.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

Middle Atlantic States

BATAVIA, N. Y.—The Genesee Light & Power Company has begun work on the erection of an electric transmission line to transmit energy to Pembroke and Corfu. Electricity will be supplied to residents along the line.

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company has been granted an extension of one year to its street-lighting contract by the City Council, to become effective Jan. 1, 1918.

BROOKLYN, N. Y.—An agreement has been reached between the officials of Queens, representatives of large manufacturing interests of Long Island City and the officials of the Brooklyn Rapid Transit Company regarding the proposed extension of the transit company's car lines into Long Island City.

BROOKLYN, N. Y.—Bids will be received by the New York Municipal Railway Corporation, 85 Clinton Street, Brooklyn, until Nov. 1 for the installation of lighting, heating and train-announcing systems for stations on the Culver Line, Brooklyn. Plans and further information may be obtained on application to the office of the chief engineer, Room 602, 85 Clinton Street.

BUFFALO, N. Y.—The New York Central Railroad Company is constructing a power plant at Curtiss and Clarke streets, to cost about $30,000.

BUFFALO, N. Y.—The Curtiss Aeroplane Corporation is building a steel test house, to cost about $28,000, at its Elmwood Avenue plant, and also a power house. A testing room is also being erected at its Austin Street plant, at a cost of about $10,000.

CLYMER, N. Y.—The Clymer Power Corporation has petitioned the Public Service Commission for permission to construct an electric-light plant in Clymer and for an approval of franchise granted by the town.

DEER HARBOR, SHELTER ISLAND, N. Y.—The Public Service Corporation has granted the village of Deer Harbor permission to install and operate a municipal electric-light plant. The village will purchase the property of the Island Realty Company and will make improvements to the plant involving an expenditure of about $7,000.

DOLGEVILLE, N. Y.—A conduit is being installed from the warehouse of the Daniel Green Felt Shoe Company on Main Street to factory No. 2 on Elm Street, which will carry electric wires, steam pipes, etc., between the two buildings. This, it is said, is part of the plan by which the company proposes to utilize its water power opportunities in the East Canada Creek to operate all of its factories in Dolgeville. A large generator, it is understood, will be installed for that purpose.

EARLVILLE, N. Y.—The Public Service Commission has granted the Earlville Electric Light Company permission to issue $7,000 in bonds at 90.

JORDAN, N. Y.—The capital stock of the Jordan Electric Light & Power Company has been increased from $25,000 to $35,000, the proceeds to be used for expansion of its system.

LONG ISLAND CITY, N. Y.—The New York & Queens Electric Company, it is reported, contemplates extensions and improvements to its plant. The company recently acquired a site, about 25 ft. by 225 ft., on Mill Street.

NEW YORK, N. Y.—The New York Edison Company is planning to enlarge its employees' building, located along the East River, between Thirty-eighth and Thirty-ninth streets.

NEW YORK, N. Y.—The Board of Aldermen is considering an ordinance providing for the erection of ornamental lamp posts within stoop lines and on sidewalks near the curb in front of places of business and apartment houses.

NEW YORK, N. Y.—Plans are being prepared by McKenzie, Voorhees & Gmelin, 1123 Broadway, New York, for the construction of a new telephone exchange building at 227 East Thirtieth Street for the New York Telephone Company, to cost about $500,000.

NIAGARA FALLS, N. Y.—Plans are being prepared by the Kellogg Products Company for the construction of a new power house in Stephenson Street.

NIAGARA FALLS, N. Y.—The Niagara Falls Gas & Electric Light Company has petitioned the Public Service Commission for permission to issue $300,000 in bonds for the purpose of building a new gas plant and extensions to mains in various parts of the city.

SARATOGA SPRINGS, N. Y.—The Adirondack Electric Power Corporation of Glens Falls has been awarded a new contract for street-lighting for a period of four years. Under the terms of the new contract the city will receive a much better service for the same amount of money it now pays.

TROY, N. Y.—The general committee in charge of the construction of the new county tuberculosis hospital has authorized a contract with the Wynantskill Hydro-Electric Power Company of West Sand Lake to furnish electricity for lamps and motors for the new hospital.

UTICA, N. Y. — Contract has been awarded by the Mutual Box Company to the John F. Hughes Construction Company, 211 Post Street, for the construction of an addition to its power house in Erie Street, to cost about $5,000.

ATLANTIC CITY, N. J.—Plans are being prepared by Addison H. Savery of Atlantic City for a new brick and concrete power house for the Haddon Hall Hotel.

ATLANTIC CITY, N. J.—The Board of Utility Commissioners has granted the Atlantic City Electric Company permission to issue $58,000 in bonds for extensions, improvements, etc.

CAMDEN, N. J.—Preparations are being made by the West Jersey & Seashore Railroad Company for the immediate installation of an electric-signaling system at its Bellevue Avenue station at Hammonton.

CAMDEN, N. J.—Plans have been approved by the City Council for furnishing telephone service to Petty Island in the Delaware River. Telephone poles will be erected in Van Buren and Twenty-ninth Streets, submarine cable will be laid, and a landing for the cable provided for.

HIGHTSTOWN, N. J.—Permission has been granted by the Board of Public Utility Commissioners to the Electric Light & Power Company of Hightstown to issue $36,000 in bonds, to provide for extensions and improvements to its system.

NEWARK, N. J.—Plans are being prepared for the erection of a new boiler room addition, 50 ft. by 70 ft., for the Titan Storage Battery Company, 4 Lister Avenue, to cost about $4,100.

NEWARK, N. J.—Bids, it is understood, will soon be called for by the Board of Freeholders for new electrical equipment to be installed in the new laundry addition at the County Hospital at Overbrook.

NEWTON, N. J.—Contract has been awarded by the Sussex Print Works, 33 Liberty Street, for the construction of a new power house, 50 ft. by 50 ft., on Sparta Avenue, to the William L. Platt Construction Company, United Bank Building, Paterson.

PERTH AMBOY, N. J.—Plans have been prepared by the American Smelting & Refining Company, 120 Broadway, New York, N. Y., for the construction of a new power house, 60 ft. by 70 ft., one story, at its local plant.

RAMSEY, N. J.—The Borough Council has entered into a contract with the Rockland Electric Company for lighting the streets of the borough for a period of five years.

TRENTON, N. J.—Plans are being prepared for the construction of a new pumping station for the John A. Roebling's Company in Canal Street.

TRENTON, N. J.—Plans have been filed and contract awarded for the erection of a new power house, 40 ft. by 50 ft., for the Luzerne Rubber Company, to cost about $5,000. Newton K. Bugbee of Trenton has the contract.

CORNWELLS, PA.—Plans have been filed by the Badenhouse Boiler Company for the construction of a new power house, about 40 ft. by 80 ft. Contract has been awarded to A. R. Raff, 1635 Thompson Street, for erection of the building at about $10,000.

ERIE, PA.—Plans have been prepared by Day & Zimmerman, engineers, 611 Chestnut Street, Philadelphia, for a new power plant at the works of the Erie Forge Company at Fifteenth and Cascade Streets.

HARRISBURG, PA.—The City Council is considering the installation of a new electric-lighting system at Riverside.

HUGHESVILLE, PA. — The Citizens' Electric Light & Power Company has petitioned the Public Service Commission for permission to issue $10,000 in bonds for improvements, etc., to its system.

NEW CASTLE, PA.—The New Castle Electric Company has petitioned the Public Service Commission to issue $20,000 in bonds for extensions and improvements to its system.

PHILADELPHIA, PA.—William Steele & Sons, 30 South Fifteenth Street, has been awarded a contract for the construction of an addition to the power plant of H. O. Wilbur at Third and New Streets.

PHILADELPHIA, PA.—Plans are being prepared for alterations and additions to the power house at Sixth Street and Columbia for the Henry Sheip Manufacturing Company. Day & Zimmerman are engineers.

PHILADELPHIA, PA.—A power plant will be erected at the corner of Coinly and Milnor Streets for the Quaker City Rubber Company, at a cost of about $5,000. Barclay, White & Company have the contract for the building.

PHILADELPHIA, PA.—The contract for the construction of the power house to be erected at Thirty-fourth and Pine Streets for the Philadelphia General Hospital has been awarded to the Standard Construction Company at $238,600. Philip H. Johnson is architect.

PHILADELPHIA, PA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Nov. 5, for construction of marine barracks, including electrical work, heating, etc., at the navy yard, Philadelphia, Pa. Drawings and specifications (No. 2555) may be obtained upon application to the above bureau or to the commandant of the navy yard named.

POTTSVILLE, PA.—Work has begun on the installation of the ornamental lighting system in the business district.

READING, PA.—The Philadelphia & Reading Railway Company has awarded a contract to the Metropolitan Edison Electric Company of Reading for furnishing electricity (1000 hp.) to its local locomotive and car shops. It is proposed to supply this service direct from the West Reading power plant, which will necessitate an extension of the 13,000-volt transmission line, which now terminates at the works of the Carpenter Steel Company.

SHARON, PA. — The Shenango Valley Electric Light Company has applied to the Public Service Commission for permission to issue $40,000 in bonds for extensions, improvements, etc., to its system.

WILMINGTON, DEL.—The Electric Hose & Rubber Company, Twenty-first and Dure Streets, Wilmington, is contemplating extensions and improvements to its plant involving an expenditure of about $20,000. C. D. Garretson is general manager.

BALTIMORE, MD.—The Consolidated Gas, Electric Light & Power Company is contemplating the construction of a substation at Falls Road and Pacific Avenue, Woodberry, to furnish electricity to the proposed plant, to be erected nearby, by the Poole Engineering Company. The station will cost about $2,000 and will be equipped with transformers and converters.

BEL AIR, MD.—Plans are being prepared by the Chesapeake & Potomac Telephone Company of Baltimore for the erection of an exchange building at Bel Air. McKenzie, Voorhees & Gmelin, 1123 Broadway, New York, N. Y., are architects.

CRISFIELD, MD.—The Maryland Utilities Company, recently incorporated with a capital stock of $100,000, proposes to operate an electric-light and power plant in Crisfield. Albert Emanuel, Louis A. Petitt, Jr., and L. Paul Ewell are among the incorporators.

SHARPTOWN, MD.—The construction of an electric railway from Sharptown to either Delmar or Salisbury, 11 and 15 miles respectively, is reported to be under consideration. The Board of Trade of Sharptown may give further information.

HUNTINGTON, W. VA.—Steps have been taken for the installation of an ornamental street-lighting system in the business district. John E. Norvell is chairman of the Chamber of Commerce committee on electric service.

NEWPORT NEWS, VA.—Subcontracts, it is reported, have been awarded by James Stewart & Company, 30 Church Street, New York, N. Y., general contractor, for the construction of an office and drafting room for the Newport News Shipbuilding & Drydock Company as follows: To Horn & Brannen Manufacturing Company of Philadelphia, Pa., for electrical fixtures to the W. G. Cornell Company of Washington, D. C., for the installation of electric wiring and fixtures, conduit and wiring, and to the Luminous Unit Company of St. Louis, Mo., for electrical fixtures. The cost of the building, it is reported, is estimated at $600,000.

NORFOLK, VA.—The Virginia Railway & Power Company has awarded a contract to J. H. Pierce of Norfolk for the construction of a substation, 20 ft. by 25 ft., one story.

NORFOLK, VA.—The Virginia Railway & Power Company has awarded a contract to J. H. Pierce, Law Building, for the construction of a new substation on Forty-seventh Street.

North Central States

DETROIT, MICH.—The Burroughs Adding Machine Company is erecting a new two-story, brick and steel power house at its plant at Third and York Avenues. Albert Kahn is architect.

MUSKEGON, MICH.—The West Michigan Steel Foundry Company contemplates the installation of a 3-ton Booth-Hall electric steel furnace. Electricity to operate the furnace will be supplied by the Consumers' Power Company.

MUSKEGON, MICH. — The Muskegon Light & Traction Company has filed its acceptance with the city of the proposed 30-year franchise recently adopted by the City Council, which will be submitted to the voters at the spring election.

TRAVERSE CITY, MICH.—The Boardman River dam and spillway in Traverse City, owned by the Boardman River Electric Light & Power Company, which was recently destroyed by fire, will be rebuilt at once. W. S. Cook is manager.

CINCINNATI, OHIO.—Estimates submitted to the Court House Commission by Rankin, Kellogg & Crane, architects, for lighting fixtures for the new court house place the cost at between $80,000 and $90,000. The commission will receive offers from manufacturers, also, to equip the court house with lighting fixtures for $80,000. The manufacturers will be allowed to submit individual designs.

CINCINNATI, OHIO.—The Union Gas & Electric Company has been awarded the contract for installing and maintaining boulevard lamps on the following streets: On Race Street, from Fourth to Twelfth; Vine Street, from Fourth to McMicken; Eight Street, from Elm to Broadway, and Pike Street, from Fourth to Pearl. The Board of Control has adopted the single-lamp standards where boulevard lamps are used. The present contract is for $60 per lamp. Work is to begin within 60 days.

CLEVELAND, OHIO.—Contracts amounting to more than $150,000 have been approved by the City Board of Control, which include an expenditure of $67,000 for a concrete foundation for the extension to the municipal electric-light plant.

CLEVELAND, OHIO.—Specifications, it is understood, will soon be issued for machine shop, foundry, forging, sheet metal, woodworking and electrical equipment for the manual training department of the Lakewood schools (Cleveland), amounting to about $100,000.

COLUMBUS, OHIO. — The Automatic Circuit Breaker Company, 153 North High Street, is remodeling a building at Sixth Street and Wesley Avenue, which will be equipped to manufacture an electrical specialty.

DAYTON, OHIO.—The Duriron Castings Company is planning to install a Booth-Hall electric furnace of ¾-ton capacity for manufacturing its special non-corrosive duriron. Energy will be secured from the Dayton Power & Light Company.

LOVELAND, OHIO.—The property of the Loveland Light & Water Company has been acquired by the Columbia Gas & Electric interests. The new owners will continue to operate the plant for some time, but eventually electricity to operate the local system will be supplied from the new generating station now being built on the river front at Cincinnati.

PIQUA, OHIO.—An ordinance providing for the installation of an ornamental street-lighting system on Wayne Street, from the Pennsylvania Railroad north to Ash Street and on Ash Street from Wayne Street to Main Street, has been passed by the Council.

LA GRANGE, KY.—The Kentucky Utilities Company of Lexington is erecting an electric transmission line to La Grange, where it was lately granted a franchise. The company has taken over the plant of S. R. Schaff & Company and will furnish a 24-hour service as soon as the line is completed.

LOUISVILLE, KY.—Two new boilers of 500 hp. will be placed in the new boiler house being erected by the Henry Vogt Machine Company to replace those now in use.

LOUISVILLE, KY.—The Embry Box Company is planning to install woodworking and box-making machinery in its factory, recently purchased at $50,000. The new plant will be equipped with electrically driven machinery.

GREENSBURG, IND.—The contract for the erection of 28 lamp posts around the public square for the new cluster lamps has been awarded to Allen Brothers.

GILLESPIE, ILL.—Plans are being considered by the Southern Illinois Light & Power Company for the erection of a new plant in Gillespie to meet the increasing demand for electrical service in this city and surrounding towns. The construction of an ice plant in connection with the electric plant is also proposed if sufficient patronage is assured. J. J. Frey, 104 East Second Street, Hillsboro, is president.

JOLIET, ILL.—The installation of a new ornamental lighting system in Chicago and Jefferson Streets has practically been decided upon by the City Council. The city also contemplates taking over the maintenance of the lamps.

WAYNESVILLE, ILL. — The National Telephone & Electric Company is planning to install 7000 ft. of underground cable and a new magneto system in Waynesville. The company was recently granted a 25-year franchise in this city.

LANCASTER, WIS. — The Mid-Continental Utilities Company, which owns and operates electric service stations in Boscobel, Fennimore, Galona, Lancaster, McGregor and other towns, is planning to erect an electric transmission line from Boscobel through Wauzeka and Woodman to Prairie du Chien and thence into Iowa, where it will connect with other towns.

MILWAUKEE, WIS.—Plans have been completed for the installation of new electric lamps on Auditorium Square and the thoroughfares leading thereto, also the entire length of Wisconsin Street. Work on the construction of the system will begin at once.

WABENO, WIS.—Plans are being prepared by the G. W. Jones Lumber Company for the construction of a new planing mill, including a 150-hp. steam generating plant, equipped with a 150-hp. Corliss engine, to be erected in connection with sawmill at Wabeno. The cost is estimated at $40,000.

WAUPACA, WIS.—The Jorgenson Manufacturing Company, recently incorporated with a capital stock of $70,000, has taken a lease, with the option of purchase, on the factory and water power of the Waupaca Felting Mills. The company is buying machinery and equipment for the manufacture of gas engine primers, carburetors and other automobile accessories. J. P. Jorgenson is president.

MONTEVIDEO, MINN.—The Northern States Power Company is contemplating the construction of a two-story building, 25 ft. by 40 ft., in Montevideo.

FORT DODGE, IOWA.—The Fort Dodge Gas & Electric Company has been granted a new 25-year electric franchise in Fort Dodge.

SAC CITY, IOWA.—The City Council has engaged G. J. Long of Webster City, engineer, to take charge of the engineering work in connection with the construction of the proposed municipal electric-light plant, to cost about $60,000.

SPILLVILLE, IOWA.—The local electric-lighting system, owned by the Spillville Electric Light Company, has been purchased by Andrew Latimer of Calmer. Mr. Latimer was recently granted a franchise by the Board of County Supervisors to erect electric transmission lines to Spillville, Fort Atkinson and Festina. Energy to operate the new line will be supplied from Clermont.

KANSAS CITY, MO.—The City Council has voted to call an election on Jan. 8, 1918, to vote on the proposal to issue $700,000 in bonds to establish the first unit of a municipal electric-light plant.

ST. JOSEPH, MO.—The St. Joseph Railway, Light, Heat & Power Company has submitted a new proposition to the City Council offering to furnish electricity for maintaining the entire street-lighting system of the city at the rate of 1½ cents per kw.-hour for the arc lamps and boulevard lamps and $37.50 per standard for the ornamental lighting system. This is a renewal of the proposal made last winter by the company when there was an agitation to vote bonds to construct a new municipal electric-light plant.

ST. LOUIS, MO.—Steps have been taken by business men on Jefferson Avenue, from Park to Russell Avenue, for the installation of an ornamental lighting system on that thoroughfare.

GARRISON, N. D.—The installation of an electric-lighting plant is under consideration.

MADDOCK, N. D.—Bids will be received until Nov. 5 for the sale of $7,000 in bonds for an electric-lighting plant in Maddock.

DELL RAPIDS, S. D.—The Northern States Power Company is contemplating the erection of an electric service line from Dell Rapids out about 8 miles.

BANCROFT, NEB.—Bids will be received by the city of Bancroft until Nov. 9 for the installation of a complete electric system, to cost about $27,000. The Electric Development Company, 803-4 Frances Building, Sioux City, Iowa, is engineer. For details see Searchlight Department.

BLOOMINGTON, NEB.—The installation of an electric generator in the water-works station to be driven by an engine already installed to furnish electricity for lighting the town in emergencies is under consideration by the Town Board.

OMAHA, NEB.—A permit has been granted the Omaha & Council Bluffs Street Railway Company for the construction of a one-story power house on Randolph Street, between Drake Street and the river, to cost $15,000. William Baumeister has the contract for the building.

ARMA, KAN.—The Kansas Gas & Electric Company of Wichita has been granted a 20-year franchise to erect and operate an electric distributing system on certain streets and alleys in Arma.

CHANUTE, KAN.—The municipal electric plant is now carrying about 40 per cent overload. In order to give good service it will be necessary to enlarge the plant.

NORTON, KAN.—A new engine, costing about $12,000, will soon be installed in the municipal electric-light plant.

Southern States

LAWNDALE, N. C.—Plans are being considered by the Piedmont Hosiery Company, recently incorporated, for the installation of electrical equipment.

WALHALLA, S. C.—The Hetrick Hosiery Mills, it is reported, is considering equipping its local plant for electrical operation throughout.

CLERMONT, GA.—The Chestatee Railway Company, recently incorporated with a capital stock of $150,000, contemplates the construction of a railway from Clermont to the mines of the Chestatee Pyrites & Chemical Company, a distance of about 9¾ miles. The incorporators are: N. P. Pratt of Decatur, J. Palmer of Pratt and others.

EASTMAN, GA.—The Georgia & Southern Utilities Company is installing a new 300-hp. engine in plant here. A new generator will soon be installed. Work is progressing on the erection of a new distributing system in the town.

GENEVA, FLA.—The Osceola Cypress Company is contemplating the installation of an electric plant in connection with its proposed mills to saw and plane lumber and manufacture lathes and shingles. E. L. Hunter is president.

LEBANON, TENN.—Bonds to the amount of $25,000 have been voted for the installation of improvements and extensions to the municipal electric-light plant and waterworks system.

NASHVILLE, TENN.—The contract for the construction of the library building, 80 ft. by 170 ft., three stories, including electric elevator, vault and mechanical plant in basement, to be erected on the college campus has been awarded by the Peabody College to the Foster-Creighton Company of Nashville; lighting, heating and plumbing contract was awarded to the Standard Engineering Company of Nashville. The cost of the building is estimated at $150,000. R. W. Selvidge is superintendent or construction for the college.

MONTGOMERY, ALA.—The Montgomery (Ala.) Light & Traction Company will begin work at once on the construction of its proposed extension to Camp Sheridan; also double-tracking its street-car line to Pickett Springs.

STUTTGART, ARK.—The City Council, we are informed, has refused to grant S. R. Morgan of Little Rock a franchise to supply electricity in Stuttgart. The Stuttgart Public Service Company, controlled by the Arkansas Light & Power Company of Pine Bluff, furnishes electrical service here.

EUFAULA, OKLA.—Plans have been completed for improvements to the waterworks system for which bids will soon be asked. The plans provide for a new power house, boiler, pumps, etc. J. L. Lowe is engineer.

TULSA, OKLA.—The Fortier Electric Manufacturing Company, it is reported, will purchase machinery to equip a plant to manufacture time switches, electric washing machines and other devices. U. D. Fortier is manager.

DENNISON, TEX.—Plans are being considered for the installation of an ornamental lighting system on Main Street for a distance of six blocks.

GOOSE CREEK, TEX.—The installation of an electric-light plant in Goose Creek is under consideration. N. L. Nelson of Sour Lake, it is reported, is interested in the project.

Pacific and Mountain States

SEATTLE, WASH.—Sites at Everett and on Lake Washington are being considered by the Sound Paper Company of Seattle on which it will erect a paper mill with a daily capacity of 400 tons, at a cost of about $6,000,000. The construction of a hydroelectric plant, to cost about $3,000,000, is included in the project.

SEATTLE, WASH.—The city of Seattle has filed a notice with the United States government of an appropriation of a power site in one of the national reserves within 100 miles of Seattle, where a large hydroelectric project will be developed. This means that the city has abandoned the plan of buying a site already developed, for which bids have been called, but the date of opening was postponed several times and it was finally announced that it has been abandoned. J. D. Ross is superintendent of lighting.

TACOMA, WASH.—Hamilton F. Gronen, commissioner of light and water, has been authorized to purchase electrical devices, such as heaters, ranges, water heaters, etc., at a cost of about $12,000. He will also soon ask for bids for 50,000 lb. of copper wire, to cost about $15,000.

EL CERRITO, CAL.—The Board of Trustees of the city of Cerrito has authorized the installation of 20 arc lamps to be erected in various parts of the city. The service will be supplied by the Western States Gas & Electric Company of Richmond.

HOT SPRINGS, CAL.—The installation of an electric-light and power plant in Hot Springs has been completed.

MANTECA, CAL.—The Sierra & San Francisco Power Company is erecting a small substation at the local refinery of the Spreckels Sugar Company, to be used exclusively for operating the plant.

MOJAVE, CAL.—At an election held recently the proposal to form a lighting district in Mojave was carried. Bids will be received by the Board of Supervisors until Nov. 5 for the installation of a lighting system here.

OAKDALE, CAL.—Preparations are being made by the Sierra & San Francisco Power Company of San Francisco for the construction of reservoirs in the mountains above Oakdale, and in enlarging its existing ditches and storage dams, which will involve an expenditure of about $5,000,000. The proposed work consists of the enlargement of the Philadelphia ditch to permit a greater flow of water and the construction of the upper Strawberry dam, which will cost about $2,225,000 and will take about three years to build. This dam will impound 80,000 acre-ft. of water. After that the Donne's Flat Reservoir, to impound 55,000 acre-ft. of water, will be built, which will cost several millions of dollars. The plans also provide for remodeling of the 9-mile flume at Sand Bar, just above the Stanislaus plant, which will cost about $1,500,000 and will double the capacity of the power plant.

PLACENTIA, CAL.—An election has been called by the Board of Supervisors to vote on the proposal to create the Placentia lighting district.

RICHMOND, CAL.—The Western States Gas & Electric Company has received an application from the newly incorporated city of El Cerrito to furnish an electric street-lighting service.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company has been awarded contracts by the Board of Supervisors for furnishing electricity for lighting the Imperial Beach, Normal Heights and Fallbrook lighting districts.

SAN FRANCISCO, CAL.—The Pacific Telephone & Telegraph Company has filed a petition with the State Railroad Commission asking for permission to operate in Marysville, Yuba County, El Paso de Robles, San Luis Obispo County, Stockton, San Joaquin County, and Watsonville, Santa Cruz County.

STANISLAUS, CAL.—The Sierras & San Francisco Power Company of San Francisco is reported to be considering an extension to its local plant, at a cost of about $1,000,000. The plans provide for doubling the present output of the power station.

STOCKTON, CAL.—An application has been filed by the Western States Gas & Electric Company with the State Water Commission asking permission to appropriate 5000 acre-ft. from Medley Lake and 7000 acre-ft. from Echo Lake, both in El Dorado County, and 8000 acre-ft. from Twin Lakes in Alpine County, for the purpose of developing 2500 hp. at the hydroelectric plant of the American River Electric Company for a period of seven months in the year.

BOISE, IDAHO.—The City Council has authorized an issue of $1,800 in bonds for the Harrison Boulevard lighting district.

HAILEY, IDAHO.—An election will be held on Nov. 15 to vote on the proposal to issue $90,000 in bonds for the installation of a municipal electric-light plant in Hailey.

BUTTE, MONT.—In a report to the Mayor and City Council the city electrician recommends the complete reorganization of the city lighting system. The city is still using the same style of lamps in the residence section that was in use 15 years ago. He also recommends that the city secure an estimate for maintenance on 400-cp. 15-amp. Mazda lamps from the Montana Power Company, to be operated on the company's lines, and that the city purchase 470 Mazda pendent lamps, to replace the old-style carbon lamps now in use. New lamps, it is estimated, will cost $6,500 installed.

WHITEFISH, MONT.—The Northern Idaho & Montana Power Company is contemplating the installation of an improved street-lighting system in Whitefish.

GALLUP, N. M.—The large transformer station on a power line from the Gallup American Coal Company's plant to the city was recently destroyed by fire.

Canada

VANCOUVER, B. C.—The Granby Consolidated Mining, Smelting & Power Company, it is reported, is contemplating the purchase of coal lands in the Nanaimo district of British Columbia, at a cost of more than $1,000,000.

ST. CATHARINES, ONT.—The Lincoln County Council has decided to light the Queenston and Grimsby stone road. This highway is 27 miles long.

WESTON, ONT.—Plans are being considered by the Water, Power and Light Commission for increasing the output of substation of the municipal electric-lighting system. It is proposed to replace three of the 50-kw. transformers with three having a capacity of 100 kw.

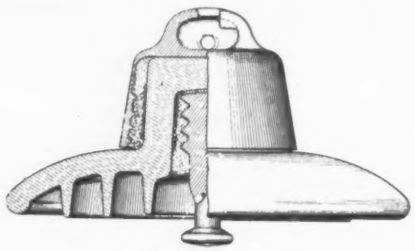
METABETCHOUAN, QUE.—Work will begin at once on the construction of a hydroelectric plant in Metabetchouan, to cost about $40,000. Eugene Gagne is reported interested in the project. J. A. Claveau of Chicoutimi is engineer.

Miscellaneous

ST. JOHNS, NEWFOUNDLAND.—Application has been made to the City Council by the St. Johns Street Railway Company for permission to extend its car lines in several directions.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washingfon, D. C., until Nov. 3, for steel cable, cast-iron pipe, condenser pipe, steel balls, cable thimbles, spelter, copper gauze, etc. Blanks and further information relating to this circular (No. 1177) may be obtained at the above office or the offices of the assistant purchasing agent, 24 State Street, New York, N. Y., and Audubon Building, New Orleans, La.

1,242,907. INSULATOR; Arthur O. Austin, Barberton, Ohio. App. filed May 12, 1916. Improved construction, combination and arrangement of parts by which any stresses or strains due to the unequal expansion or contraction of the parts, or the bursting or blowing out of the insulator proper, may be permitted without causing the actual separation of the parts or causing the insulator unit to fail mechanically.



1,242,907—Insulator

1,242,910. MOTOR-CONTROL SYSTEM; Howard L. Beach, Edgewood Park, Pa. App. filed Aug. 6, 1915. Provides a plurality of resistors, which are connected in shunt relation to the motor armature.

1,242,936. SYSTEM OF DISTRIBUTION AND CONTROL; Rudolf E. Hellmund. Pittsburgh, Pa. App. filed Feb. 19, 1914. Relates to alternating-current, single-phase distribution systems and to the control of polyphase induction motors adapted to be operated therefrom through the agency of a so-called phase converter.

1,242,937. SYSTEM OF CONTROL; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed May 25, 1914. Special reference to the regulation of phase converters that are employed for converting single-phase alternating-current energy into polyphase energy for supplying polyphase dynamo-electric machines.

1,242,962. TRANSFORMER FOR METERING SYSTEMS; Jesse E. Mateer and Walter R. Woodward, Wilkinsburg, Pa. App. filed Sept. 10, 1915. Combination of voltage and current transformers utilized in a polyphase metering system.

1,242,971. STABILIZING AND POWER-FACTOR CORRECTING MEANS FOR ELECTRICAL CIRCUITS; John F. Peters, Edgewood Park, Pa. App. filed March 4, 1916. Adapted to furnish power to electric arc furnaces or other power-consuming devices.

1,242,988. APPARATUS FOR OXIDIZING GASES; Frank C. Schmitz, New York, N. Y. App. filed Oct. 21, 1914. Improvements.

1,243,004. METHOD OF ELECTRIC WELDING AND ARTICLES PRODUCED THEREBY; Albertis C. Taylor, Warren, Ohio. App. filed March 12, 1917. By the application of pressure and the crossing of two separate electric currents in a restricted area in the opposed meeting surfaces of the said pieces.

1,243,009. ELECTRODE AND PROCESS OF MAKING THE SAME; Jorgen E. Thomsen, Jersey City, N. J. App. filed Feb. 2, 1917. The composition is partly of carbon.

1,243,057. WIRE HANGER; Alexander L. Fox, East St. Louis, Ill. App. filed Dec. 7, 1915. Body is rigidly or firmly clamped between the supporting wire and the connecting yoke, so that it cannot readily be turned either for the purpose of releasing or mounting it without the use of the polygonal enlargement or head on the binding device.

1,243,111. GALVANIC CELL; John F. Sanders, Roseburg, Ore. App. filed July 19, 1915. Improvements in cathodes for galvanic cells.

1,243,166. ELECTRIC SWITCH; Gerald W. Hart, West Hartford, Conn. App. filed July 12, 1916. Produces an electric switch which is subject to manual and electric control in such a manner that it is opened manually and closed electrically.

1,243,202. STORAGE BATTERY; William H. Muzzy, Dayton, Ohio. App. filed Feb. 26, 1916. Evaporated water is automatically replaced.

1,243,204. CURRENT-COLLECTING DEVICE; Louis C. Nichols, Norwood, Ohio. App. filed May 15, 1914. Provides a brush-holder and cross-connecting device of improved construction and capable of being assembled as a unitary device and independently of the casing or other part of the dynamo-electric machine.

1,243,246. OUTLET BOX; William A. Bonnell, Brooklyn, N. Y. App. filed Dec. 24, 1914. Type provided with conduit openings normally closed by means of removable plates, known as knock-outs.

Record of Electrical Patents

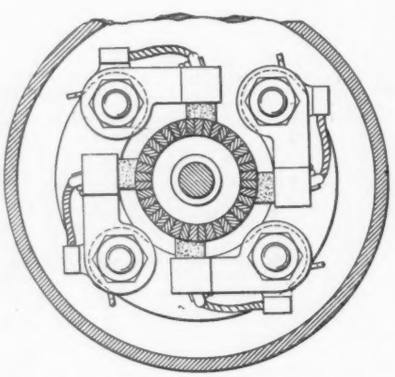
Notes on United States Patents issued on October 16, 1917

1,243,274. METHOD AND APPARATUS FOR ELECTRICALLY MAKING COPPER TUBES; Elisha Emerson, Auburn, R. I. App. filed Jan. 26, 1917. Provides a fusible ring of a material such as lead and of the diameter which the inner circumference of the tube is to possess, and then rotates the ring in a weak sulphuric-acid solution until the desired metallic thickness has been deposited on the ring; then splits the ring and applies heat thereto so as to cause the lead or other material to melt and run out of the copper tube, leaving the latter finished and ready for use.

1,243,280. ELECTRIC ACTION FOR ORGANS; Ellis F. Frost, Washington, D. C. App. filed Nov. 15, 1915. Improvements.

1,243,283. ELECTRICAL SERVICE CUT-OUT SEAL; William W. Givot, Omaha, Neb. App. filed Aug. 16, 1915. Improvements.

1,243,286. SLIP RING FOR DYNAMO-ELECTRIC MACHINES; Wilhelm Gscheidlen, Berlin-Schmargendorf, Germany. App.



1,243,204—Current-Collecting Device

filed May 28, 1914. Provides a slip ring for machinery of this kind which consists of a material of high conductivity and at the same time possesses great tensile strength in its peripheral direction.

1,243,307. SYSTEM OF DISTRIBUTION AND CONTROL; Benjamin G. Lamme, Pittsburgh, Pa. App. filed March 23, 1914. Has particular reference to phase converters to be employed in converting energy from a single-phase system into polyphase energy for operating dynamo-electric machines.

1,243,308. SIGNAL SYSTEM; Malcolm E. Launbranch, Chicago, Ill. App. filed July 28, 1916. In connection with display signs.

1,243,358. SUPPORTING MEANS FOR ELECTRIC MOTORS; Charles F. Stoddard, Boston, Mass. App. filed Aug. 21, 1911. So designed that the vibration and noise from motors shall be reduced to a minimum.

1,243,368. SEPARATOR FOR STORAGE BATTERIES AND PROCESS OF PRODUCING THE SAME; Theodore A. Willard, Cleveland, Ohio. App. filed June 30, 1914. Improvement.

1,243,369. TUBULAR DIAPHRAGM FOR STORAGE-BATTERY ELECTRODES AND PROCESS OF PRODUCING THE SAME; Theodore A. Willard, Cleveland, Ohio. App. filed Aug. 3, 1914. Improvement.

1,243,370. STORAGE-BATTERY SEPARATOR AND PROCESS OF PRODUCING THE SAME; Theodore A. Willard, Cleveland, Ohio. App. filed Feb. 1, 1915. Such that the separators will have greater mechanical strength and greater porosity, and hence higher efficiency, and can be more cheaply produced.

1,243,412. ELECTRIC SADIRON; Davydd C. Hughes, Chicago, Ill. App. filed Jan. 15, 1917. Consists in the arrangement of the heating elements along the side walls of the base, in means for clamping the elements against these walls, in the structural formation of the heating elements, in improved means for electrically connecting these elements together and to the terminals of the iron, and in the mounting of the terminals upon the base of the iron.

1,243,416. PROCESS OF MAKING ALLOY CASTINGS; Woolsey McA. Johnson, Hartford, Conn. App. filed March 3, 1914. Provision of a process which can be economically operated upon any desired scale, whether large or small, and which is, moreover, capable of operation, if desired, in an intermittent manner and without substantial or material loss of the volatile metal.

1,243,430. SYSTEM OF DISTRIBUTION AND CONTROL; Benjamin G. Lamme, Pittsburgh, Pa. App. filed Dec. 26, 1913. Special reference to the control of railway polyphase induction motors which are adapted to receive energy from a single-phase system of distribution.

1,243,433. DOOR LOCK; William A. Lurie, Chicago, Ill. App. filed Aug. 30, 1915. For controlling the opening of the lock from a distance.

1,243,481. ELECTRIC LIGHT FIXTURE; Richard M. Beard, New York, N. Y. App. filed July 1, 1916. Reflector may be temporarily supported in place while the lamp socket and other portions of the fixture are being secured in position, means being thus furnished whereby the entire fixture may be readily assembled and placed in position by one man.

1,243,482. ELECTRIC PUSH BUTTON; David E. Blair, Montreal, Quebec, Can. App. filed April 10, 1915. Street cars.

1,243,490. ELECTRIC HEATERS; Harry W. Denhard, Milwaukee, Wis. App. filed Jan. 30, 1911. Electric irons.

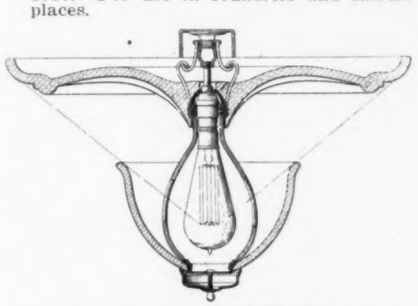
1,243,524. METHOD AND APPARATUS FOR TREATING AIR; William T. Hoofnagle, Glen Ridge, N. J. App. filed May 25, 1915. Relates to an improved method of treating air, gases and vapors electrically, and to an apparatus for carrying out the method.

1,243,571. ELECTRIC CONTROLLING SYSTEM; Herbert S. Valentine, Philadelphia, Pa. App. filed June 30, 1915. Provides a motor-controlling system, including a solenoid or similar brake, a controller and controlling resistance, all so connected that a breakage in the resistance will cut off current from the brake winding and thereby cause setting of the holding brake at any running position of the controller.

1,243,589. ART OF ARC WELDING, HEATING AND METAL WORKING; Charles L. Coffin, Parks, Ga. App. filed April 5, 1916. Improvements.

1,243,608. THERMOSTATIC INDICATOR; John M. Johnson, Kansas City, Mo. App. filed May 24, 1917. For disclosing the temperature of automobile radiators and the temperature of the water therein.

1,243,628. VIBRATOR; Walter van B. Roberts, Princeton, N. J. App. filed June 2, 1916. For use in foundries and similar places.



1,243,481—Electric Light Fixture

1,243,665. CONTROLLER FOR ELECTRIC MOTORS; George H. Whittingham, Bancroft Park, Md. App. filed Nov. 8, 1915. For driving individual machines.

1,243,675. STANDARD ELECTRIC LAMP; George T. Irwin, Toronto, Ontario, Can. App. filed Nov. 6, 1916. Means whereby a lamp bulb and shade may be adjusted to any desired position convenient to the user.